Middle Santa Ana River
Water Quality Monitoring Plan

PREPARED BY
CDM

ON BEHALF OF
Santa Ana Watershed Project Authority
San Bernardino County Stormwater Program
Riverside County Flood Control District
Cities of Chino, Chino Hills, Corona, Fontana, Montclair, Norco, Ontario, Rancho Cucamonga, Rialto, Riverside, and Upland
Milk Producers Council, and Chino Watermaster Agricultural Pool

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Section 1 Introduction

Various waterbodies in the Middle Santa Ana River watershed are listed on the state 303(d) list of impaired waters due to high levels of fecal coliform bacteria. The Middle Santa Ana River (MSAR) Bacterial Indicator Total Maximum Daily Load (TMDL) was adopted by the Santa Ana Regional Water Quality Control Board (RWQCB) and approved by the State Water Resources Control Board (SWRCB) to address these fecal coliform impairments. Environmental Protection Agency (EPA) Region 9 approved the TMDL May 16, 2007. As part of the TMDL Implementation Plan, implementation of a bacteria monitoring program for the MSAR watershed is required. In addition, monitoring may be incorporated into the implementation of activities designed to gather information regarding urban and agricultural sources of bacteria. This MSAR Water Quality Monitoring Plan ("Monitoring Plan") describes all monitoring programs implemented to support TMDL compliance, providing information on sample locations, collection, frequency, and the types of analyses that will be conducted.

1.1 Regulatory Background

Table 3-1 of the Santa Ana Regional Water Quality Control Plan (Basin Plan) designates beneficial uses for surface waters in the Santa Ana River watershed (RWQCB 1995). The beneficial uses applicable to waterbodies in the MSAR watershed include Water Contact Recreation (REC-1), which is defined in the Basin Plan as follows:

> "waters are used for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses may include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and use of natural hot springs" (Basin Plan, page 3-2).

The Basin Plan (Chapter 4) specifies fecal coliform as a bacterial indicator for pathogens ("bacterial indicator"). Fecal coliform present at concentrations above certain thresholds are believed to be an indicator of the presence of fecal pollution and harmful pathogens, thus increasing the risk of gastroenteritis in bathers exposed to the elevated levels. The Basin Plan currently specifies the following water quality objectives for fecal coliform:

REC-1 *- Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period.*

The EPA published new bacteria guidance in 1986 (EPA 1986). This guidance advised that for freshwaters *Escherichia coli* (*E. coli*) is a better bacterial indicator than fecal coliform. Epidemiological studies found that the positive correlation between *E. coli* concentrations and the frequency of gastroenteritis was better than the correlation between fecal coliform concentrations and gastroenteritis.

The RWQCB is currently considering replacing the REC-1 bacteria water quality objectives for fecal coliform with *E. coli* objectives. This evaluation is occurring through the work of the Stormwater Quality Standards Task Force (SWQSTF). The SWQSTF is comprised of representatives from various stakeholder interests, including the Santa Ana Watershed Protection Authority, the counties of Orange, Riverside, and San Bernardino, Orange County Coastkeeper, Inland Empire Waterkeeper, the RWQCB, and EPA Region 9.

In 1994 and 1998, because of exceedences of the fecal coliform objective established to protect the REC-1 use, the RWQCB added various waterbodies in the MSAR watershed to the state 303(d) list of impaired waters. The MSAR Watershed TMDL Task Force ("TMDL Task Force"), which includes representation by many key watershed stakeholders, was subsequently formed to address this impairment through the development of a TMDL for the watershed. The MSAR Bacterial Indicator TMDL addresses bacterial indicator impairments in the following MSAR watershed waterbodies (Figure 1-1):

1.1.1 Santa Ana River, Reach 3 – Prado Dam to Mission Boulevard in the City of Riverside

1.1.2 Chino Creek, Reach 1 – Santa Ana River confluence to beginning of hard lined channel south of Los Serranos Road

1.1.3 Chino Creek, Reach 2 – Beginning of hard lined channel south of Los Serranos Road to confluence with San Antonio Creek

1.1.4 Mill Creek (Prado Area) – Natural stream from Cucamonga Creek Reach 1 to Prado Basin

1.1.5 Cucamonga Creek, Reach 1 – Confluence with Mill Creek to 23rd Street in City of Upland

1.1.6 Prado Park Lake

The TMDL for these waters established compliance targets for both fecal coliform and *E. coli*:

- *Fecal coliform:* 5-sample/30-day Logarithmic Mean less than 180 organisms/100 mL and not more than 10% of the samples exceed 360 organisms/100 mL for any 30-day period.

- *E. coli:* 5-sample/30-day Logarithmic Mean less than 113 organisms/100 mL and not more than 10% of the samples exceed 212 organisms/100 mL for any 30-day period.

The implementation plan contained in the MSAR Bacterial Indicator TMDL requires that, no later than six months from the effective date of the TMDL (date of EPA approval), the U.S. Forest Service, the County of San Bernardino, the County of Riverside, the cities of Ontario, Chino, Chino Hills, Montclair, Rancho Cucamonga, Upland, Rialto, Fontana, Norco, Riverside, Corona, Pomona, and Claremont[1], and agricultural operators in the watershed submit as a group (or individually) to the RWQCB for approval, a watershed-wide monitoring program that will provide the data necessary to review and update the adopted TMDL.

The TMDL also requires the development and implementation of two plans: (1) an Urban Source Evaluation Plan (USEP) to identify activities, operations, and processes in urban areas that contribute bacterial indicators to MSAR watershed waterbodies; and (2) an Agricultural Source Evaluation Plan (AgSEP) to identify activities, operations, and processes in agricultural areas that contribute bacterial indicators to MSAR watershed waterbodies. The TMDL requires that the USEP and AgSEP be submitted to the RWQCB for approval by November 30, 2007.

[1] The cities of Pomona and Claremont are not participants of the TMDL Task Force and are not participants in any of the monitoring activities described in this Monitoring Plan

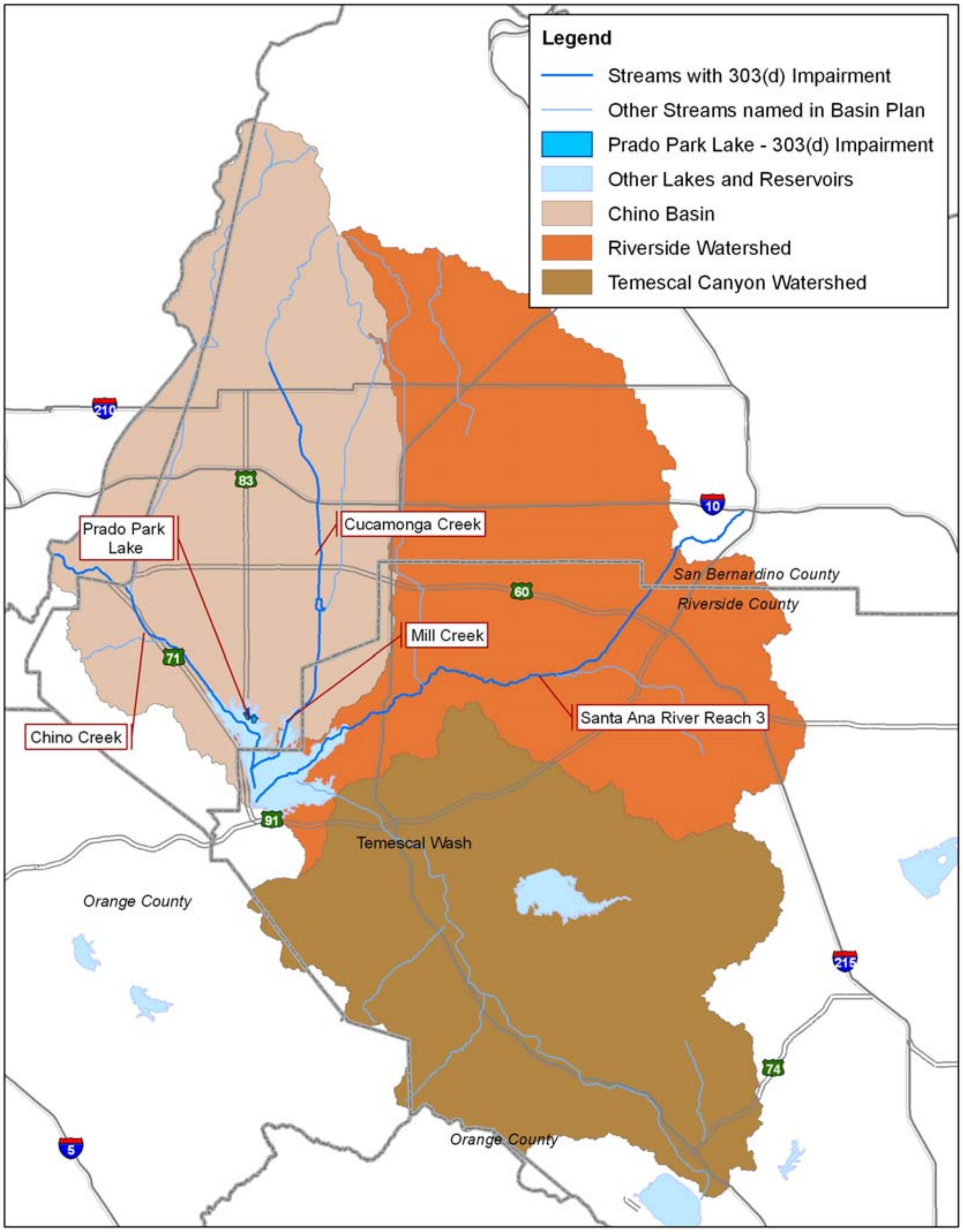

Figure 1
Bacterial Indicator Impairments in the MSAR Watershed

1.2 Proposition 40 State Grant

In anticipation of an approved TMDL, the Santa Ana Watershed Project Authority (SAWPA), in cooperation with the San Bernardino County Flood Control District (SBCFCD), Riverside County Flood and Water Conservation District (RCFWCD), and Orange County Water District (OCWD) submitted a Proposition 40 grant proposal to the SWRCB to support the implementation of TMDL requirements. This grant proposal, *Middle Santa Ana River Pathogen TMDL – BMP Implementation* (Grant Project), was developed, in part, to characterize urban bacteria sources within the watershed. This characterization will provide the basis for the development and implementation of the USEP requirements of the TMDL. The grant proposal also included a study to evaluate selected Best Management Practices (BMPs) for their efficacy in removing or reducing bacteria in urban runoff. The state approved the grant proposal in fall 2006 and the Grant Project, which will be completed by December 2008, was initiated.

1.3 Agricultural Community Funding

In summer 2007, representatives of the Milk Producers Council and Chino Watermaster Agricultural Pool approved funding to support initiation of TMDL implementation tasks that are the responsibility of the agricultural community, i.e., development of the AgSEP which includes the Agricultural Source Evaluation Monitoring Program.

1.4 Purpose of the MSAR Water Quality Monitoring Plan

This Water Quality Monitoring Plan was prepared to fulfill four objectives:

1.4.1 Establish and implement the Bacterial Indicator Watershed-Wide Monitoring Program required by the TMDL. The monitoring described for this program will continue until the numeric targets described in the MSAR Bacterial Indicator TMDL are achieved and the waterbodies are removed from the 303(d) list upon adoption of the TMDL.

1.4.2 Implement monitoring funded by the Grant Project to characterize urban sources of bacteria within the watershed and support the USEP element of the TMDL. The monitoring described for this program will occur only between July 1, 2007 and March 31, 2008.

1.4.3 Implement monitoring to characterize agricultural sources of bacteria within the watershed and support the AgSEP element of the TMDL. The monitoring described for this program will occur between November 2008 through March 2009.

1.4.4 Implement monitoring to evaluate the effectiveness of selected treatment BMPs (bioswale, extended detention basin, and proprietary devices) for reducing bacteria concentrations in urban runoff. The monitoring described for this program will occur between January 1, 2008 and June 15, 2008.

It is important to recognize that the Monitoring Plan elements associated with the USEP, AgSEP, and BMP Implementation should be considered distinct from the Monitoring Plan elements associated with the Watershed-Wide Monitoring Program. That is, once USEP, AgSEP, and BMP-related monitoring activities are complete, the only elements of this Monitoring Plan that will continue are the elements associated with the Watershed-Wide Monitoring Plan.

The requirements for each monitoring program are fully explained in Sections 2 through 5 of this Monitoring Plan. Section 6 provides requirements for water quality sample collection and handling, and collection of field measurements under any sampling program. Section 7 provides a brief synopsis of data management requirements.

1.5 Watershed Description

The MSAR watershed covers approximately 488 square miles and lies largely in the southwestern corner of San Bernardino County, and the northwestern corner of Riverside County. A small part of Los Angeles County (Pomona/Claremont area) is also included. The MSAR watershed includes three sub–watersheds (Figure 1):

1.5.1 Chino Basin (San Bernardino County, Los Angeles County, and Riverside Counties) – Surface drainage in this area, which is directed to Chino Creek and Mill-Cucamonga Creek, flows generally southward, from the San Gabriel Mountains toward the Santa Ana River and the Prado Flood Control Basin.

1.5.2 Riverside Watershed (Riverside County) – Surface drainage in this area is generally westward or southeastward from the City of Riverside and the community of Rubidoux to Reach 3 of the Santa Ana River.

1.5.3 Temescal Canyon Watershed (Riverside County) – Surface drainage in this area is generally northwest to Temescal Creek.

Land uses in the MSAR watershed include urban, agriculture, and open space. Although originally developed as an agricultural area, the watershed is rapidly urbanizing. Incorporated cities in the MSAR watershed include Chino, Chino Hills, Claremont, Corona, Fontana, Montclair, Norco, Ontario, Pomona, Rancho Cucamonga, Rialto, Riverside, and Upland. In addition, there are several pockets of urbanized unincorporated areas. Open space areas include National Forest lands and State Park lands.

The current population of the watershed, based upon 2000 census data, is approximately 1.4 million people. The principal remaining agricultural area in the watershed is the area formerly known as the Chino Dairy Preserve. This area is located in the south central part of the Chino Basin subwatershed and contains approximately 300,000 cows (although this number is quickly declining as the rate of development increases). Recently, the cities of Ontario, Chino, and Chino Hills annexed the San Bernardino County portions of this area. The remaining portion of the former preserve, which is in Riverside County, remains unincorporated.

Section 2
Watershed-Wide Monitoring Program

The MSAR TMDL implementation plan contained recommended sample locations, sample frequency, and constituents to be analyzed for water samples. To a large degree, this Watershed-Wide Monitoring Program incorporates the recommendations of the TMDL. The following sections describe the site locations, frequency of sampling, weather conditions, and types of analyses that will be conducted to fulfill requirements for watershed-wide monitoring under the TMDL.

2.1 Watershed-Wide Monitoring Program Framework

The purpose of the Watershed-Wide Monitoring Program is to assess compliance with REC-1 use water quality objectives for fecal coliform and evaluate numeric targets established for *E. coli*. As noted above, the Basin Plan currently relies solely on fecal coliform as the bacterial indicator for protection of the REC-1 use. However, the RWQCB is currently evaluating the use of *E. coli* for the REC-1 use water quality objective. In anticipation of the adoption of new *E. coli* water quality objectives, both fecal coliform and *E. coli* targets were incorporated into the TMDL and will be evaluated in water samples collected under this Watershed-Wide Monitoring Plan.

Consistent with the TMDL, the following constituents will be analyzed in water samples collected at each site on each sample date:

2.1.1 *Field Analysis:* Temperature, conductivity, pH, dissolved oxygen, and turbidity

2.1.2 *Laboratory Water Quality Analysis:* Fecal coliform, *E. coli*, and total suspended solids (TSS)

Table 1
Constituents Monitored and Analytical Methods

Parameter	Laboratory	Units	Analytical Method	Target Report Limits
Temperature	In Field	°C	YSI or equivalent	NA
pH	In Field	Standard Units	YSI or equivalent	NA
Dissolved Oxygen	In Field	mg/l	YSI or equivalent	NA
Conductivity	In Field	mS/cm	YSI or equivalent	NA
Turbidity	In Field	NTU	YSI or equivalent	NA
E. coli	Orange County Public Health	cfu/100 ml	EPA 1603	10 cfu/100 mL
Fecal coliform	Orange County Public Health	cfu/100 ml	SM 9222D[1]	2 cfu/100 mL
TSS	Orange County Public Health	mg/l	SM 2540D[1]	0.5 mg/L

[1] APHA, 1998

Where appropriate, the results of the water quality sampling will be compared to the TMDL compliance targets for fecal coliform and *E. coli*:

2.1.3 *Fecal coliform:* 5-sample/30-day Logarithmic Mean less than 180 organisms/100 mL and not more than 10% of the samples exceed 360 organisms/100 mL for any 30-day period.

2.1.4 *E. coli:* 5-sample/30-day Logarithmic Mean less than 113 organisms/100 mL and not more than 10% of the samples exceed 212 organisms/100 mL for any 30-day period.

Other sample results, e.g., for field parameters and TSS, will be compared to bacteria data to evaluate the presence of any correlations.

2.2 Sample Locations

As noted above, the purpose of the Watershed-Wide Monitoring effort is to measure compliance with numeric targets established by the TMDL, which are derived from Basin Plan objectives established to protect the REC-1 beneficial use. Two key factors were used to select watershed sites:

2.2.1 The sites should be located on waterbodies that are impaired and thus incorporated into the TMDL; and

2.2.2 The sites should be located in reaches of the impaired waterbodies where REC-1 activity is likely to occur, i.e., there is an increased risk from exposure to pathogens.

Using the impaired waters list, recreational use data developed by the Santa Ana River Watershed Stormwater Quality Standards Task Force, and recommendations from Regional Board staff, six sites were selected (Figure 2):

2.2.3 Icehouse Canyon Creek

2.2.4 Chino Creek at Central Avenue

2.2.5 Santa Ana River at Pedley Avenue

2.2.6 Santa Ana River at MWD Crossing

2.2.7 Prado Park Lake at Lake Outlet

2.2.8 Mill Creek at Chino-Corona Road

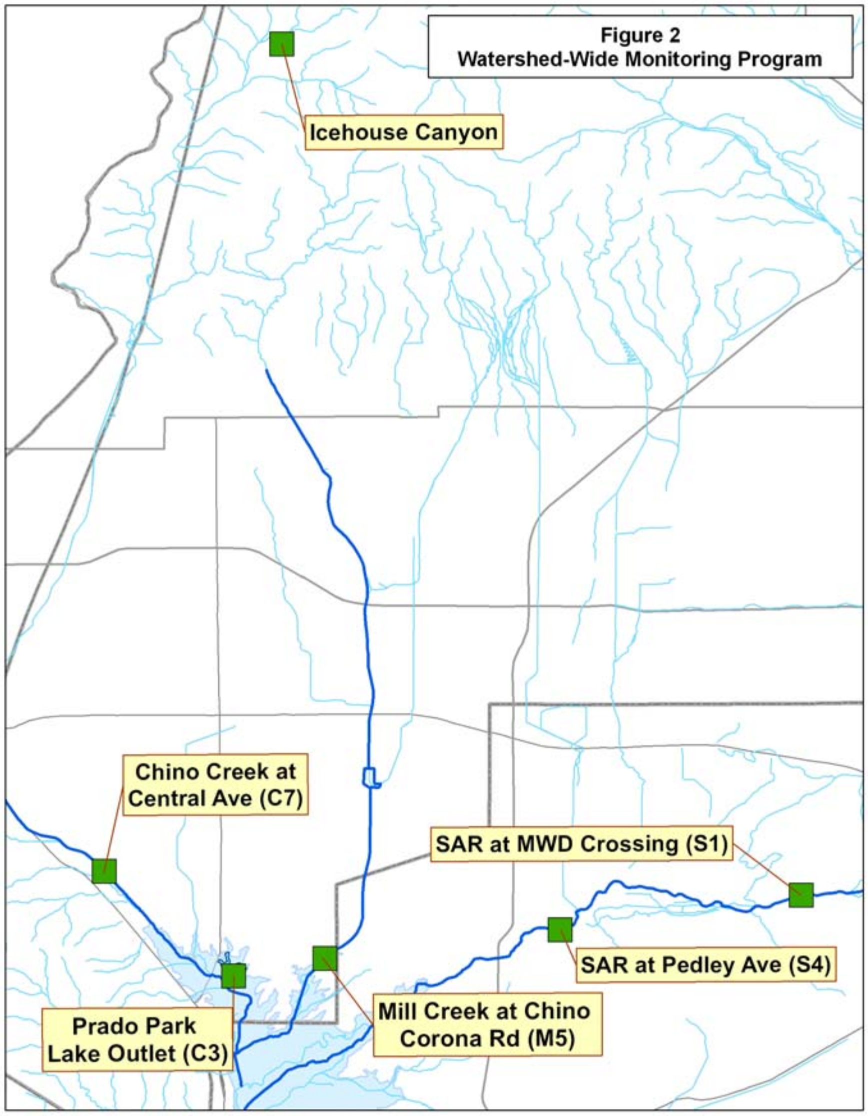

Table 2 provides a brief site description and GPS coordinate location for each of these six Watershed-Wide Monitoring Program sample locations. Attachment A provides site photographs and more detailed field descriptions, including site access information.

Table 2 Watershed-Wide Monitoring Program Sample Locations			
Site ID	**Site Description**	**Longitude**	**Latitude**
WW-C1	Icehouse Canyon Creek	-117.6290	34.2604
WW-C3	Prado Park Lake at Lake Outlet	-117.6473	33.9400
WW-C7	Chino Creek at Central Avenue	-117.6884	33.9737
WW-M5	Mill Creek at Chino-Corona Rd	-117.6156	33.9460
WW-S1	Santa Ana River Reach 3 @ MWD Crossing	-117.4479	33.9681
WW-S4	Santa Ana River Reach 3 @ Pedley Ave	-117.5327	33.9552

All of the above sites were recommended as Watershed-Wide Monitoring sites in the TMDL or very close to recommended sites. The rationale for not including other sites recommended in the TMDL is as follows:

2.2.9 Temescal Wash at Lincoln Avenue – This waterbody was incorporated into the USEP Monitoring Program because it is a potential urban source of bacteria to an impaired waterbody (Santa Ana River Reach 3). Also, Temescal Wash itself is not listed as impaired and therefore not subject to MSAR Bacterial Indicator TMDL requirements.

2.2.10 Tequesquite Arroyo at Palm Avenue – This site was incorporated into the USEP Monitoring Program because it is a potential source of bacteria to an impaired waterbody (Santa Ana River Reach 3). Also, Tequesquite Arroyo itself is not listed as impaired and therefore not subject to MSAR Bacterial Indicator TMDL requirements.

2.2.11 Cucamonga Creek at Regional Plant 1 – This site was not included primarily because the channel is concrete-lined; accordingly, there is a very low expectation of recreational activity because of the lack of a natural channel and lack of access. However, nearby storm drains that may contribute elevated bacteria concentrations to this impaired reach of Chino Creek are included in the USEP Monitoring Program.

2.2.12 Chino Creek at Schaeffer – This site was not included primarily because the channel is concrete-lined; accordingly, there is a very low expectation of recreational activity because of the lack of a natural channel and lack of access. The Stormwater Quality Standards Task Force characterized this site in its Phase I efforts, and, based on the findings from that characterization, the likelihood of REC-1 activity is very low. Nearby storm drains that may contribute elevated bacteria concentrations to this impaired reach of Chino Creek are included in the USEP Monitoring Program.

2.2.13 Chino Creek at Prado Golf Course – This site was not included as it would be somewhat redundant to the upstream Chino Creek at Central Avenue site. The Regional Board has evidence that the Central Avenue site is used for REC-1 activities; accordingly, it will serve as a better location for monitoring to meet Watershed-Wide Monitoring Program objectives.

The TMDL recommended that the following four sites be incorporated into the Watershed-Wide Monitoring Program for sampling only during storm events:

2.2.14 Bon View Avenue at Merrill Avenue

2.2.15 Archibald Avenue at Cloverdale Avenue

2.2.16 Grove Channel at Pine Avenue

2.2.17 Euclid Avenue Channel at Pine Avenue

None of these sites were incorporated into the Watershed-Wide Monitoring Program for the following reasons:

2.2.18 Per the Regional Board, the primary reason for the inclusion of these wet weather sites was the need to assess water quality runoff in drains carrying runoff that primarily originates from agricultural areas. Rather than include these sites in the Watershed-Wide Monitoring Program, these sites may be considered for inclusion in the Agricultural Source Evaluation Plan that will be developed as part of the TMDL implementation plan.

2.2.19 All of these sites are storm drains and not listed as impaired waterbodies; accordingly, the objective of the Watershed-Wide Monitoring Program (compliance with the TMDL numeric targets) does not apply at these locations.

2.2.20 None of these sites are locations of expected REC-1 use activity.

2.3 Sample Frequency

Table 3 provides a detailed schedule for monitoring activities at Watershed-Wide Monitoring sites. For the purposes of this monitoring plan, a sample event is defined as week in which samples are collected. Sample events are scheduled by week ending dates, meaning that for a given week samples could be collected any day between Sunday and Saturday (which marks the end of the week). However, every effort will be made to collect samples from Monday through Wednesday of each week. This sampling effort is generally described as follows:

2.3.1 Dry Season (April 1 – October 31): Four 30-day intervals will be sampled with five samples collected approximately weekly during each 30-day period. To allow for calculation of a rolling 30-day geometric mean, the four 30-day intervals will typically occur in sequence, resulting in 20 samples collected over 20 consecutive weeks (an approximately 120-day period). However, in 2007-2008, three 30-day intervals will occur in 2007 and one interval will occur in 2008.

2.3.2 Wet Season (November 1 – March 31): The goal of the wet season sampling effort is to obtain samples from both dry and wet weather periods during the wet season. To best accomplish this goal, a sample schedule with some built-in flexibility has been established:

2.3.2.1 *Fixed Sample Dates* – Eleven samples will be collected over an eleven week period from mid-December to mid-February. The collection of samples over a continuous 11-week period will provide the opportunity to calculate a rolling geometric mean. This weekly sampling will occur on a regular schedule regardless of whether flows are at base levels or elevated because of wet weather.

2.3.2.2 *Flexible (Storm Event) Sample Dates* – The goal of having flexible sample dates is to obtain data from the falling limb of the hydrograph following one storm event during the wet season. To the extent practical, taking into account the timing of the storm event, when a storm event occurs, four samples will be collected from each site as follows: Sample 1 will be collected on the day of the storm event and should be taken when it is apparent that flow within the channel is elevated above typical dry weather conditions as a result of rainfall induced runoff. Samples 2, 3 and 4 will be collected 48, 72, and 96 hours following the storm event. If no wet weather events have occurred by late February, then samples will be added to the end of the fixed sample dates—weeks ending March 1 through March 22.

For the purposes of this Monitoring Plan, the decision whether to conduct wet weather sampling will be approached by implementing the following steps: (1) prepare to deploy the sampling team if rain is forecasted (National Weather Service forecast on Accuweather.com), i.e., the sample teams are put on stand-by; (2) if rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and (3) mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so that they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

Limiting mobilization to first daylight regardless of when rainfall begins, addresses two requirements: (1) For safety purposes, sampling may only be conducted during daylight hours; and (2) samples must be dropped off at the laboratory no later than 1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on- site assessment conducted by the field team leader.

Table 3. Sample Frequency/Schedule for Proposed Sample Sites

		2007 Dry Season (Week Ending)																				
		15-Week Sampling Effort - Rolling Geometric Mean																				
		14-Jul			21-Jul			28-Jul			4-Aug			11-Aug			18-Aug			25-Aug		
	Site Location	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]
Watershed-Wide Monitoring	Icehouse Canyon Creek (WW-C1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Prado Park Lake at Lake Outlet (WW-C3)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Chino Creek at Central Avenue (WW-C7)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Mil Creek at Chino-Corona Road (WW-M5)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at Pedley Avenue (WW-S4)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at MWD Crossing (WW-S1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
Urban Source Evaluation Monitoring	Santa Ana Reach (SAR) at La Cadena Drive (US-SAR)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Box Springs Channel at Tesquequite Avenue (US-BXSP)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Sunnyslope Channel near confluence with SAR (US-SNCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Anza Drain near confluence with Riverside Effluent Channel (US-ANZA)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	San Sevaine Channel in Riverside near confluence with SAR (US-SSCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Day Creek at Lucretia Avenue (US-DAY)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Temescal Wash at Lincoln Avenue (US-TEM)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Cypress Channel at Kimball Avenue (US-CYP)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	San Antonio Channel at Riverside Drive (US-SACH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Carbon Canyon Creek Channel at Pipeline Avenue (US-CCCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Chris Basin Outflow - Lower Deer Creek (US-CHRIS)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	County Line Channel near confluence with Cucamonga Creek (US-CLCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Cucamonga Creek at Hwy 60 - Above RP1 (US-CUC)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	OC	N	B&C	OC	N	N	N	N	N	N	N
	Sample Number (SBC)	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
	Sample Number (B&C)	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0	0	0	0	0	0	0
	Sample Number (Bacteroides - OCWD)	0	0	0	0	0	0	0	13	0	0	13	0	0	13	0	0	0	0	0	0	0
	Sample Number (Bacteroides - UC)	0	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		2007 Dry Season (Week Ending)																							
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		1-Sep			8-Sep			15-Sep			22-Sep			29-Sep			6-Oct			13-Oct			20-Oct		
	Site Location	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]
Watershed-Wide Monitoring	Icehouse Canyon Creek (WW-C1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Prado Park Lake at Lake Outlet (WW-C3)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Chino Creek at Central Avenue (WW-C7)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Mil Creek at Chino-Corona Road (WW-M5)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at Pedley Avenue (WW-S4)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at MWD Crossing (WW-S1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
Urban Source Evaluation Monitoring	Santa Ana Reach (SAR) at La Cadena Drive (US-SAR)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Box Springs Channel at Tesquequite Avenue (US-BXSP)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Sunnyslope Channel near confluence with SAR (US-SNCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Anza Drain near confluence with Riverside Effluent Channel (US-ANZA)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	San Sevaine Channel in Riverside near confluence with SAR (US-SSCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Day Creek at Lucretia Avenue (US-DAY)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Temescal Wash at Lincoln Avenue (US-TEM)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Cypress Channel at Kimball Avenue (US-CYP)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	San Antonio Channel at Riverside Drive (US-SACH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Carbon Canyon Creek Channel at Pipeline Avenue (US-CCCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Chris Basin Outflow - Lower Deer Creek (US-CHRIS)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	County Line Channel near confluence with Cucamonga Creek (US-CLCH)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Cucamonga Creek at Hwy 60 - Above RP1 (US-CUC)	B&C	N	UC	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	N	N	N	N	N	N	N	N	N
	Sample Number (SBC)	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
	Sample Number (B&C)	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	0
	Sample Number (Bacteroides - OCWD)	0	0	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0
	Sample Number (Bacteroides - UC)	0	0	13	0	0	13	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0

		2008 Dry Season (Week Ending)														
		5-Week Sampling Effort (Geometric Mean)														
		17-May			24-May			31-May			7-Jun			14-Jun		
	Site Location	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]
Watershed-Wide Monitoring	Icehouse Canyon Creek (WW-C1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Prado Park Lake at Lake Outlet (WW-C3)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Chino Creek at Central Avenue (WW-C7)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Mil Creek at Chino-Corona Road (WW-M5)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at Pedley Avenue (WW-S4)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at MWD Crossing (WW-S1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
Urban Source Evaluation Monitoring	Santa Ana Reach (SAR) at La Cadena Drive (US-SAR)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Box Springs Channel at Tesquequite Avenue (US-BXSP)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Sunnyslope Channel near confluence with SAR (US-SNCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Anza Drain near confluence with Riverside Effluent Channel (US-ANZA)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	San Sevaine Channel in Riverside near confluence with SAR (US-SSCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Day Creek at Lucretia Avenue (US-DAY)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Temescal Wash at Lincoln Avenue (US-TEM)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Cypress Channel at Kimball Avenue (US-CYP)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	San Antonio Channel at Riverside Drive (US-SACH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Carbon Canyon Creek Channel at Pipeline Avenue (US-CCCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Chris Basin Outflow - Lower Deer Creek (US-CHRIS)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	County Line Channel near confluence with Cucamonga Creek (US-CLCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Cucamonga Creek at Hwy 60 - Above RP1 (US-CUC)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Sample Number (SBC)	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
	Sample Number (B&C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample Number (Bacteroides - OCWD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample Number (Bacteroides - UC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Wet Season (Week Ending or Sample No)																																
		11 Week Sampling Effort (Rolling Geometric Mean)																																
		15-Dec			22-Dec			29-Dec			5-Jan			12-Jan			19-Jan			26-Jan			2-Feb			9-Feb			16-Feb			23-Feb		
	Site Location	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]
Watershed-Wide Monitoring	Icehouse Canyon Creek (WW-C1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Prado Park Lake at Lake Outlet (WW-C3)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Chino Creek at Central Avenue (WW-C7)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Mil Creek at Chino-Corona Road (WW-M5)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at Pedley Avenue (WW-S4)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at MWD Crossing (WW-S1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
Urban Source Evaluation Monitoring	Santa Ana Reach (SAR) at La Cadena Drive (US-SAR)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Box Springs Channel at Tesquequite Avenue (US-BXSP)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Sunnyslope Channel near confluence with SAR (US-SNCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Anza Drain near confluence with Riverside Effluent Channel (US-ANZA)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	San Sevaine Channel in Riverside near confluence with SAR (US-SSCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Day Creek at Lucretia Avenue (US-DAY)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Temescal Wash at Lincoln Avenue (US-TEM)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Cypress Channel at Kimball Avenue (US-CYP)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	San Antonio Channel at Riverside Drive (US-SACH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Carbon Canyon Creek Channel at Pipeline Avenue (US-CCCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Chris Basin Outflow - Lower Deer Creek (US-CHRIS)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	County Line Channel near confluence with Cucamonga Creek (US-CLCH)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Cucamonga Creek at Hwy 60 - Above RP1 (US-CUC)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Sample Number (SBC)	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
	Sample Number (B&C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0	13	0	0
	Sample Number (Bacteroides - OCWD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0	0	0	13	0
	Sample Number (Bacteroides - UC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0	0	0	13	0	0	0

		Wet Season (Week Ending or Sample No)											
		Storm Event Sampling[4]											
		1			2			3			4		
	Site Location	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]	W[1]	Bt (OCWD)[2]	Bt (UC)[3]
Watershed-Wide Monitoring	Icehouse Canyon Creek (WW-C1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Prado Park Lake at Lake Outlet (WW-C3)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Chino Creek at Central Avenue (WW-C7)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Mil Creek at Chino-Corona Road (WW-M5)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at Pedley Avenue (WW-S4)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
	Santa Ana River Reach 3 at MWD Crossing (WW-S1)	SBC	N	N	SBC	N	N	SBC	N	N	SBC	N	N
Urban Source Evaluation Monitoring	Santa Ana Reach (SAR) at La Cadena Drive (US-SAR)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Box Springs Channel at Tesquequite Avenue (US-BXSP)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Sunnyslope Channel near confluence with SAR (US-SNCH)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Anza Drain near confluence with Riverside Effluent Channel (US-ANZA)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	San Sevaine Channel in Riverside near confluence with SAR (US-SSCH)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Day Creek at Lucretia Avenue (US-DAY)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Temescal Wash at Lincoln Avenue (US-TEM)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Cypress Channel at Kimball Avenue (US-CYP)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	San Antonio Channel at Riverside Drive (US-SACH)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Carbon Canyon Creek Channel at Pipeline Avenue (US-CCCH)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Chris Basin Outflow - Lower Deer Creek (US-CHRIS)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	County Line Channel near confluence with Cucamonga Creek (US-CLCH)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Cucamonga Creek at Hwy 60 - Above RP1 (US-CUC)	B&C	N	UC	B&C	OC	N	B&C	N	UC	B&C	OC	N
	Sample Number (SBC)	6	0	0	6	0	0	6	0	0	6	0	0
	Sample Number (B&C)	13	0	0	13	0	0	13	0	0	13	0	0
	Sample Number (Bacteroides - OCWD)	0	0	0	0	13	0	0	0	0	0	13	0
	Sample Number (Bacteroides - UC)	0	0	13	0	0	0	0	0	13	0	0	0

SBC = San Bernardino County Flood Control District; B&C = Brown & Caldwell; OCWD = Orange County Water District; UC = University California Davis

1 Collection of water quality samples for laboratory analysis (fecal coliform, E. coli and TSS), field parameter data (temperature, dissolved oxygen, turbidity, pH, and conductivity), or for pathogen scoping study. Samples collected by either San Bernardino County Flood Control District (SBC) or Brown & Caldwell (B&C) staff. "N" means that no sample is collected during that week.

2 Water samples collected for analysis of Bacteroides (Bt) by Orange County Water District (OCWD)

3 Water samples collected for analysis of Bacteroides (Bt) by University of California Davis (UC)

4 Sampling conducted during storm event (Day 0) and for days 2, 3 and 4 (representing 48, 72 and 96 hrs) after storm event. If no such event occurs, then sampling will occur weekly beginning week ending March 1

2.4 Sampling Schedule for 2008-2009 and Subsequent Years

Watershed-wide monitoring for TMDL compliance beginning in spring 2008 and subsequent years will be conducted for the same constituents, site locations, and wet/dry season frequency as during the Grant Project period (2007-2008). However, the start and end date of the dry season sampling period will begin earlier in subsequent years. Table 4 provides the monitoring schedule for the 2008-2009 watershed-wide monitoring. Table 5 provides starting and ending dates for dry and wet season sampling in subsequent years if sampling occurs.

Table 4
Sample Frequency/Schedule for Watershed-Wide TMDL Compliance Monitoring (2008-2009)

Season	Sites	Number of events	Sample Dates *
Dry	Icehouse Canyon Creek Prado Park Lake at lake outlet Chino Creek at Central Avenue Mil Creek at Chino-Corona Road Santa Ana River Reach 3 at MWD Crossing Santa Ana River Reach 3 at Pedley Ave	20	Weekly from week ending May 17 through week ending October 4 (Note: the first five weeks of the 2008 sampling effort will be conducted as part of the Grant Project)
Wet	Icehouse Canyon Creek Prado Park Lake at lake outlet Chino Creek at Central Avenue Mil Creek at Chino-Corona Road Santa Ana River Reach 3 at MWD Crossing Santa Ana River Reach 3 at Pedley Ave	15	Fixed Sample Dates: Weekly from week ending December 13 through week ending February 28 Flexible Sample Dates: Grab sample on day of 1/2 rainfall-runoff event and for 48, 72, and 96 hours following the event

* See Table 5 for start weeks in Subsequent Years

Table 5
Start / End Weeks for Wet and Dry Season Sampling in Future Years

Sampling Year	Dry Season	Wet Season
2009 – 2010	May 16 / Oct 3	Dec 19 / Mar 6
2010 – 2011	May 15 / Oct 2	Dec 18 / Mar 5
2011 – 2012	May 14 / Oct 1	Dec 17 / Mar 3
2012 – 2013	May 19 / Oct 6	Dec 15 / Mar 2
2013 – 2014	May 18 / Oct 5	Dec 14 / Mar 1
2014 – 2015	May 19 / Oct 6	Dec 13 / Feb 28
2015 – 2016		Dec 19 / Mar 5
2016 – 2017		Dec 17 / Mar 4
2017 – 2018		Dec 16 / Mar 3
2018 – 2019		Dec 15 / Mar 2
2019 – 2020		Dec 14 / Feb 29
2020 – 2021		Dec 19 / Mar 6
2021 - 2022		Dec 18 / Mar 5
2022 - 2023		Dec 17 / Mar 4
2023 - 2024		Dec 16 / Mar 2
2024 - 2025		Dec 14 / Mar 1

Section 3
USEP Monitoring Program

Elevated levels of indicator bacteria have been documented in most monitored waterbodies within the MSAR watershed; however, the sources of bacteria remain unknown. Thus, the primary goal of the USEP Monitoring Program is to guide efforts to control bacteria sources derived from discharges covered by MS4 NPDES permits. The water quality sampling and analyses conducted for this effort will be coordinated with the Watershed-Wide Monitoring Program described above, but only during the period that the Grant Project, which funds this effort, is active.

3.1 USEP Monitoring Program Framework

Sampling will occur for the USEP Monitoring Program from July 2007 to March 31, 2008. This end date coincides with Grant Project requirements. Although the Grant Project ends August 2008, to meet project goals, it is necessary to complete sampling by the end of March 2008 so that the collected data can be incorporated into the Grant Project deliverables. Once the USEP Monitoring Program sampling effort is completed (March 31, 2008), then no additional sample collection from the USEP sample locations is planned under this Monitoring Plan.

The following data will be collected during each sampling event at each USEP Monitoring Program site:

3.1.1 Field Analysis: Temperature, conductivity, pH, dissolved oxygen, and turbidity

3.1.2 Laboratory Water Quality Analysis: Fecal coliform, *E. coli*, and total suspended solids

3.1.3 Flow: During each sample event, if conditions are safe, flow will be characterized

3.1.4 *Bacteroides* Analysis: All samples will be assayed for *Bacteroides* host-specific markers for humans, ruminant, and domestic canine to provide a semi-quantitative estimate of their relative abundance.

The field and water quality analysis methods for the USEP sites are the same as for the Watershed-Wide monitoring sites. These methods are summarized in Table 1. Methods for the collection of flow data and the collection of water samples for conducting molecular analyses are described below in Section 4.

In addition to collecting a flow measurement at each site during each sampling event, the hydrologic connectivity of the surface flow at each site to the downstream impaired waterbody (Santa Ana River Reach 3, Mill Creek, Cucamonga Creek, and Chino Creek Reach 1 and 2) will be characterized to the extent possible. The purpose of characterizing the hydrologic connectivity is to determine whether flow from the sampled waterbody reaches the impaired waterbody. Connectivity will be characterized at the following sites prior to all sampling events:

3.1.5 San Sevaine Channel

3.1.6 Box Springs Drain

3.1.7 County Line Channel

The hydrologic connectivity of the remaining USEP Monitoring Program sites will be characterized during at least one field sampling event in each 30-day sampling period in July and September 2007 and in February 2008. In addition, the hydrologic connectivity will be characterized to the extent possible during storm event sampling.

If hydrologic connectivity is not apparent at a given site, samples will not be collected from the site on that day.

3.2 USEP Monitoring Program Locations

Site selection was based on the following general collective and site-specific criteria:

3.2.1 Collectively, selected sites that discharge to an impaired water should, to the extent practical, characterize water quality tributary to the segment with the 303(d) listed impairment, which may include upstream segments of the same waterbody;

3.2.2 Collectively, selected sites tributary to an impaired water should have the potential to contribute a high percentage of the flow (volumetrically) to the impaired water;

3.2.3 A selected site should be close to the base of its watershed so that it characterizes the majority of flow reaching the impaired water from that tributary;

3.2.4 Flow at a selected site should not include any permitted effluent discharge; and

3.2.5 Flow at a selected site should generally occur under both dry and wet weather conditions.

Based on these general considerations, the following sites (with their association to an impaired waterbody) will be sampled under the USEP Monitoring Program (Figure 3):

3.2.6 Santa Ana River, Reach 3

3.2.6.1 Santa Ana River at La Cadena

3.2.6.2 Box Springs Drain (includes Tequesquite Arroyo)

3.2.6.3 Sunnyslope Channel

3.2.6.4 Anza Drain

3.2.6.5 San Sevaine Channel

3.2.6.6 Day Creek

3.2.6.7 Temescal Wash

3.2.7 Chino Creek, Reach 1

3.2.7.1 Cypress Channel

3.2.8 Chino Creek, Reach 2

3.2.8.1 San Antonio Channel

3.2.8.2 Carbon Canyon Creek Channel

3.2.9 Mill Creek (Prado Area)

3.2.9.1 Lower Deer Creek Channel

3.2.9.2 County Line Channel

3.2.10 Cucamonga Creek, Reach 1

3.2.10.1 Cucamonga Creek at Highway 60 (above RP1 discharge)

The specific sampling location on each of the above waterbodies was selected in coordination with staff from the SBCFCD and RCFWCD. Table 6 provides a brief site description and GPS coordinate location for each of the 13 USEP Monitoring Program locations. Attachment B presents photographs and field descriptions for each selected USEP Monitoring Program site.

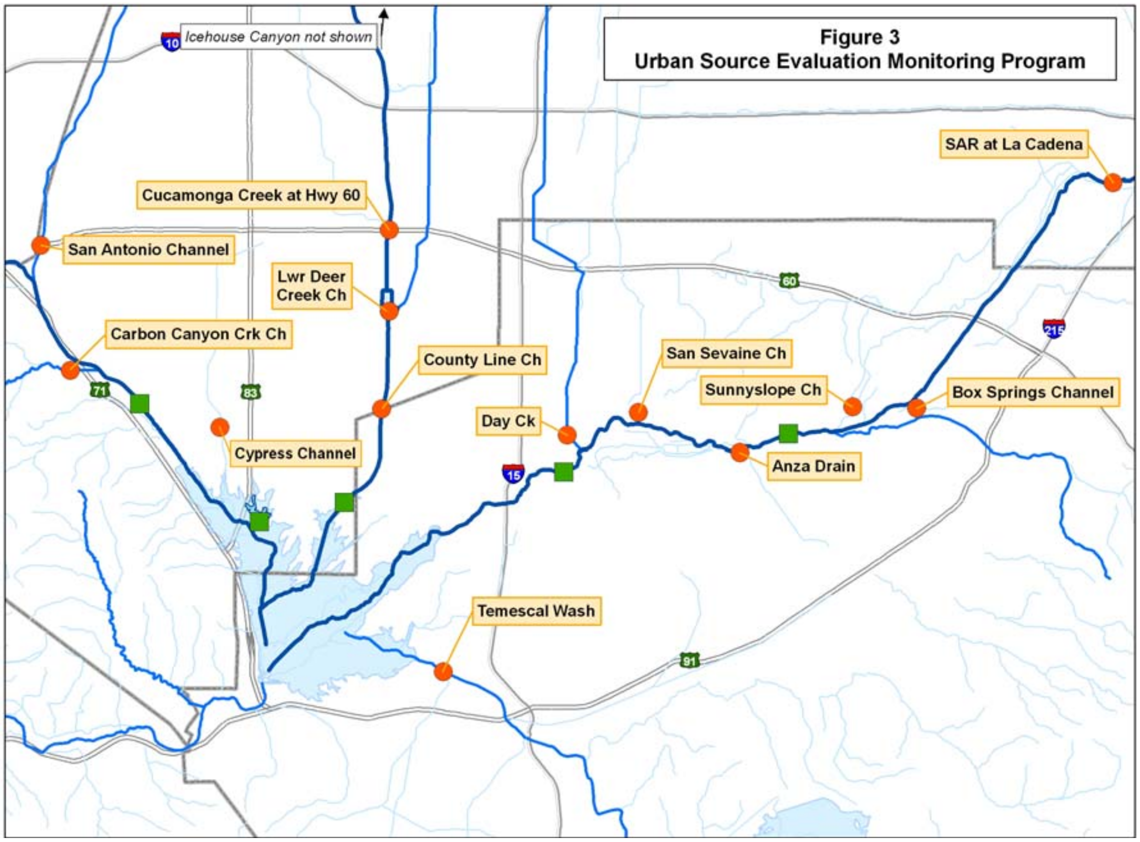

Table 6 USEP Monitoring Program Site Locations			
Site ID	**Site Description**	**Longitude**	**Latitude**
Santa Ana River, Reach 3			
US-SAR	Santa Ana River (SAR) at La Cadena Drive	-117.33065	34.04453
US-BXSP	Box Springs Channel at Tequesquite Avenue	-117.40272	33.97592
US-SNCH	Sunnyslope Channel near confluence with SAR	-117.42630	33.97620
US-ANZA	Anza Drain near confluence with Riverside effluent channel	-117.46795	33.96212
US-SSCH	San Sevaine Channel in Riverside near confluence with SAR	-117.50555	33.97430
US-DAY	Day Creek at Lucretia Avenue	-117.53192	33.96708
US-TEM	Temescal Wash at Lincoln Avenue	-117.57723	33.89412
Chino Creek, Reach 1			
US-CYP	Cypress Channel at Kimball Avenue	-117.66043	33.96888
Chino Creek, Reach 2			
US-SACH	San Antonio Channel at Walnut Ave	-117.73417	34.01703
US-CCCH	Carbon Canyon Creek Channel at Pipeline Avenue	-117.71585	33.98617
Mill Creek (Prado Area)			
US-CHRIS	Chris Basin Outflow (Lower Deer Creek)	-117.59802	34.00498
US-CLCH	County Line Channel near confluence with Cucamonga Creek	-117.60063	33.97492
Cucamonga Creek, Reach 1			
US-CUC	Cucamonga Creek at Highway 60 (Above RP1)	-117.59950	34.07007

3.3 Sample Frequency

Table 3 (see Page 15) provides a detailed schedule for monitoring activities at USEP Monitoring Program sites. Sampling events are scheduled for week ending dates, meaning that samples could be collected any day up to the Saturday that marks the end of the week. However, every effort will be made to collect samples during the first two or three days of each week (Monday through Wednesday). This sampling effort is generally described as follows:

3.3.1 Dry Season (April 1 – October 31): Two 30-day intervals will be sampled with five samples collected approximately weekly during each 30-day period. Sampling will occur within the 20-week timeframe established for the Watershed-Wide Monitoring Program sites (see above) – generally during the months of July and September.

3.3.2 Wet Season (November 1 – March 31): The goal of the wet season sampling effort is to obtain samples from both dry and wet weather periods during the wet season. To best accomplish this goal, a sampling schedule with some built-in flexibility has been established. Accordingly, the sample effort is divided into a combination of fixed and flexible sample dates:

3.3.2.1 *Fixed Sample Dates* – Six samples will be collected approximately weekly from mid-January through mid-February. Sampling will occur regardless of whether flows are at base levels or are elevated because of wet weather.

3.3.2.2 *Flexible (Storm Event) Sample Dates* – The goal of having flexible sample dates is to obtain data from the falling limb of the hydrograph following one storm event during the wet season. To the extent practical, taking into account the timing of the storm event, when a storm event occurs, four samples will be collected from each site as follows: Sample 1 will be collected on the day of the storm event and should be taken when it is apparent that flow within the channel is elevated above typical dry weather conditions as result of rainfall induced runoff. Samples 2, 3 and 4 will be collected 48, 72, and 96 hours following the storm event. If no wet weather events have occurred by mid-February, then samples will be added to the end of the fixed sample dates – weeks ending March 1 through March 22.

For the purposes of this Monitoring Plan, the decision whether to conduct wet weather sampling will be approached by implementing the following steps: (1) prepare to deploy the sampling team if rain is forecasted (National Weather Service forecast on Accuweather.com), i.e., the sample teams are put on stand-by; (2) if rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and (3) mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

Limiting mobilization to first daylight regardless of when rainfall begins, addresses two requirements: (1) For safety purposes, sampling may only be conducted during daylight hours; and (2) samples must be dropped off at the laboratory no later than 1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on- site assessment conducted by the field team leader.

Section 4
AgSEP Monitoring Program Framework

Elevated levels of indicator bacteria have been documented in most monitored waterbodies within the MSAR watershed; however, the sources of bacteria remain unknown. Thus, the primary goal of the AgSEP Monitoring Program is to guide efforts to control bacteria sources derived from agricultural discharges which include stormwater runoff, wastewater release, and tailwater runoff from agricultural lands. Agricultural land uses in the MSAR watershed include concentrated animal feeding operations (CAFO) and irrigated and dry-land farming. The water quality sampling and analyses conducted for this effort will be coordinated with the Watershed-Wide Monitoring Program as described in Section 2, but only during the period that the AgSEP Monitoring Program is active.

4.1 AgSEP Monitoring Program Framework

Sampling will occur for the AgSEP Monitoring Program from November 2008 through March 2009.

Once the AgSEP Monitoring Program sampling effort is completed, then no additional sample collection from the AgSEP sample locations is currently planned under this Monitoring Plan. However, based upon findings from the monitoring carried out at AgSEP sites, the TMDL Task Force may determine that additional monitoring is necessary. If additional monitoring does occur at these sites, then this Monitoring Plan will be amended as deemed appropriate.

The following data will be collected during each sampling event at each AgSEP Monitoring Program site:

4.1.1 Field Analysis: Temperature, conductivity, pH, dissolved oxygen, and turbidity

4.1.2 Laboratory Water Quality Analysis: Fecal coliform, *E. coli*, and total suspended solids

4.1.3 Flow: During each sample event, if conditions are safe, flow will be characterized

4.1.4 *Bacteroides* Analysis: All samples will be assayed for *Bacteroides* host-specific markers for humans, ruminant, and domestic canine to determine if they are present and to provide a semi-quantitative estimate of their relative abundance.

The field and water quality analysis methods for the AgSEP sites are the same as those for the Watershed-Wide and USEP monitoring sites. These methods are summarized in Table 1. Methods for the collection of flow data and the collection of water samples for conducting molecular analyses are described below in Section 6.

4.2 AgSEP Monitoring Program Locations

In the TMDL, Table 5-9a-a "Additional Watershed Storm Event Sampling Locations" listed four proposed wet weather sampling locations (as referenced above at Paragraphs 2.2.14 through 2.2.17). Per the RWQCB, the primary reason for the inclusion of these wet weather sites in the TMDL was the need to assess water quality runoff in drains carrying runoff that primarily originates from agricultural areas (personal communication, William Rice, RWQCB).

These same four sites, as proposed in the TMDL, were considered for inclusion in the AgSEP Monitoring Program. After field review and based upon the recommendation of the RWQCB staff, the proposed sampling locations at Archibald Avenue at Cloverdale Avenue and Grove Channel at Pine Avenue were replaced due to increasing urban development within the vicinity of these sites since the development of the TMDL. In addition, a backup site was selected for the Eucalyptus Avenue at Walker Site because of uncertainty regarding the ability to sample this site under wet weather conditions (the sample team will make an on-site decision regarding where to sample during a storm event). The newly selected wet weather AgSEP Monitoring sites are shown in Figure 3a.

Table 6a provides a brief site description and GPS coordinate location for each of the AgSEP Monitoring Program locations. Attachment C presents photographs and field descriptions for each selected AgSEP Monitoring Program site.

4.2 Grove Avenue Channel at Merrill Avenue (AG-G2)

4.2 Eucalyptus Avenue at Walker Avenue (AG-G1)

4.2.1 Eucalyptus Avenue at Cleveland Avenue (AG-CL1) – [*backup site* to Walker Avenue site depending on wet weather flow conditions]

4.2 Euclid Avenue Channel at Pine Avenue (AG-E2)

4.2 Cypress Channel at Kimball Ave (AG-CYP1) – [dual site; same as USEP site, US-CYP]

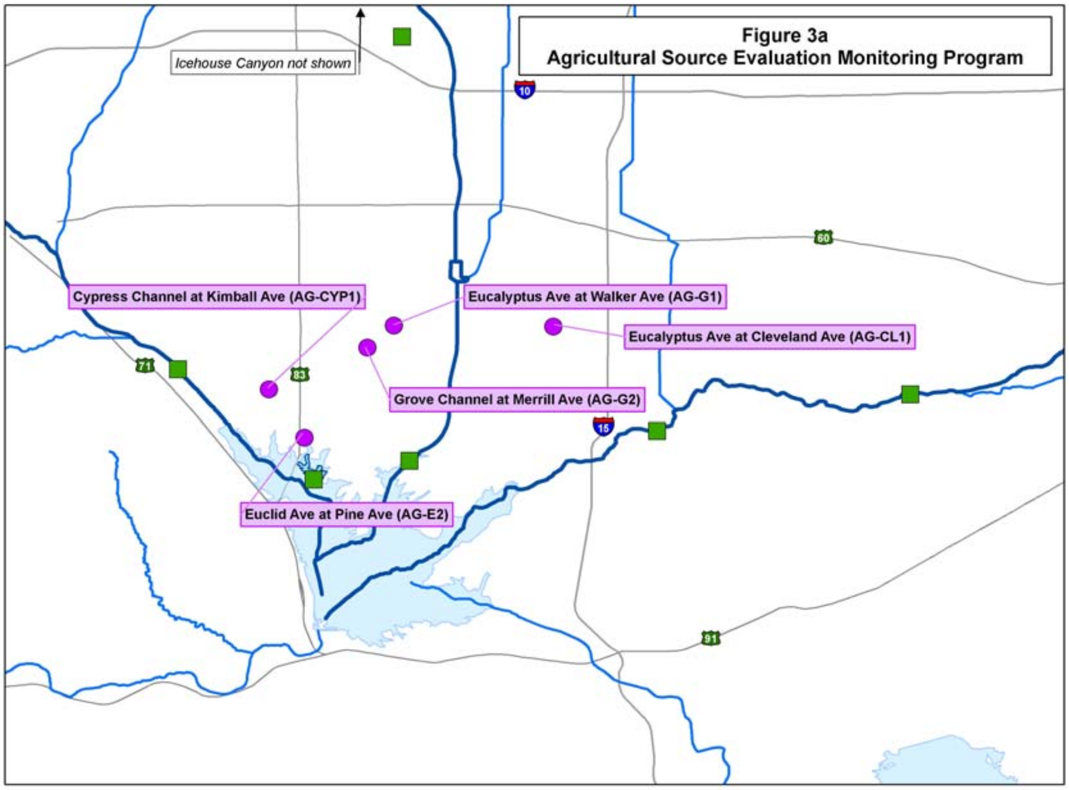

Table 6a AgSEP Monitoring Program Site Locations			
Site ID	**Site Description**	**Latitude**	**Longitude**
Prado Park Lake			
AG-G2	Grove Avenue Channel at Merrill Avenue	33 58.986	-117 37.685
AG-G1	Eucalyptus Avenue at Walker Avenue	33 59.425	-117 37.163
AG-E2	Euclid Avenue Channel at Pine Avenue	33 57.220	-117 38.926
Cucamonga Creek, Reach 1			
AG-CL1	Eucalyptus Avenue at Cleveland Avenue (*Backup to Walker Avenue, depending on flow conditions)* (CL1)	33 59.405	-117 34.031
Chino Creek, Reach 1			
AG-CYP1	Cypress Channel at Kimball Avenue (*dual site; same as USEP site US-CYP*)	33.96888	-117.66043

4.3 Sample Frequency

Table 6b provides a detailed schedule for monitoring activities at AgSEP Monitoring Program sites. This sampling effort is generally described as follows:

Wet Season (November 1 – March 31): The goal of the wet season sampling effort is to obtain samples from wet weather periods during the wet season. To best accomplish this goal, a sampling schedule with some built-in flexibility has been established.

Flexible (Storm Event) Sample Dates – The goal of having flexible sample dates is to obtain data from two storm events during the wet season. If two storm events do not occur in one wet season, then the second storm event will be sampled in the next wet season. To the extent practical, taking into account the timing of the storm event, when a storm event is sampled, two samples will be collected from each site as follows:

Sample 1 will be collected during the storm event upon arrival at the sample location. Sample 2 will be collected 30 minutes after the collection of the first sample.

For the purposes of this Monitoring Plan, the decision whether to conduct wet weather sampling will be approached by implementing the following steps: (1) prepare to deploy the sampling team if rain is forecasted (National Weather Service forecast on Accuweather.com), i.e., the sample teams are put on stand-by; (2) if rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and (3) mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

Limiting mobilization to first daylight regardless of when rainfall begins, addresses two requirements: (1) For safety purposes, sampling may only be conducted during daylight hours; and (2) samples must be dropped off at the laboratory no later than 1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment conducted by the field team leader.

Table 6b. AgSEP Sample Frequency/Schedule for Proposed Sample Sites		Wet Season							
		Storm Event 1 Sampling[3]				Storm Event 2 Sampling[3]			
Site Location		Sample 1		Sample 1 + 30 min		Sample 1		Sample 1 + 30 min	
		W[1]	Bt (UC)[2]	W[1]	Bt (UC)[2]	W[1]	Bt (UC)[2]	W[1]	Bt (UC)[2]
Agricultural Source Evaluation (AGSEP) Monitoring	Cypress Channel at Kimball Avenue (AG-CYP1)	CDM	UC	CDM	UC	CDM	UC	CDM	UC
	Euclid Avenue Channel at Pine Avenue (AG-E2)	CDM	UC	CDM	UC	CDM	UC	CDM	UC
	Eucalyptus Avenue at Walker Avenue (AG-G1)	CDM	UC	CDM	UC	CDM	UC	CDM	UC
	Grove Avenue Channel at Merrill Avenue (AG-G2)	CDM	UC	CDM	UC	CDM	UC	CDM	UC
	Sample Number (CDM)	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**
	Sample Number (Bacteroides - UC)	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**

CDM = Camp Dresser & McKee; UC = University California Davis

1 Collection of water quality samples for laboratory analysis (fecal coliform, E. coli and TSS), field parameter data (temperature, dissolved oxygen, turbidity, pH, and conductivity), or for pathogen scoping study. Samples collected by CDM *(Tentatively)* or Consultant Team (TBD)

2 Water samples collected for analysis of Bacteroides (Bt) by University of California Davis (UC)

3 Multiple Sampling conducted during storm event with second sample collected 30 minutes after initial sample.

Section 5
BMP Effectiveness Monitoring Program

The Proposition 40 State Grant project (see Section 1.2) included a BMP Pilot Study to evaluate selected BMPs for their effectiveness in removing or reducing bacteria in urban runoff. The BMP Effectiveness Monitoring Program described in this section supports this pilot study.

Stormwater treatment BMPs (e.g., wet ponds, grass swales, stormwater wetlands, sand filters, dry detention, etc.) are widely used to reduce pollutant concentrations and loadings in urban runoff, e.g., from sediment, nutrients, and oil and grease. However, BMP technologies have not been widely studied with regard to their effectiveness in reducing bacteria in urban runoff. In fact, the Water Quality Management Plan (WQMP) Guidance documents for the Riverside and San Bernardino County stormwater permit programs describe the effectiveness of many BMPs recommended for bacteria removal as “unknown.” These BMPs include biofilters, detention basins, wet ponds, wetlands, and manufactured proprietary devices. Thus, the primary goal of the BMP Effectiveness Monitoring Program is to evaluate the bacteria removal effectiveness of selected BMPs.

5.1 BMP Effectiveness Monitoring Program Framework

BMP Effectiveness Monitoring Program sampling will occur from January 2008 to June 15, 2008. Once completed, then no additional sample collection will occur for this program under this Monitoring Plan.

The following data will be collected during each sampling event at each BMP Effectiveness Monitoring Program site:

5.1.1 Field Analysis [2]: Temperature, conductivity, pH, dissolved oxygen, and turbidity

5.1.2 Laboratory Water Quality Analysis: Fecal coliform, *E. coli*, and total suspended solids

5.1.3 Flow: During each sample event, if conditions are safe, flow will be characterized

The field and water quality analysis methods for the BMP Monitoring sites are the same as for the Watershed-Wide, USEP, and AGSEP monitoring sites. These methods are summarized in Table 1.

Methods for the collection of flow data and the collection of water samples are described below in Section 6.

[2] Collect only one set of field analyses during each BMP site visit.

5.2 BMP Effectiveness Monitoring Program Locations

BMP monitoring locations were selected in collaboration with the cities of Canyon Lake, Corona, Fontana, Moreno Valley, Riverside, and the Flood Control Districts of the counties of Riverside and San Bernardino. Emphasis was placed on (1) selecting locations with structural BMPs for which bacteria removal effectiveness is generally unknown; and (2) identifying locations where proprietary BMPs could be tested. Ideal locations were those with relatively easy access for sampling dry weather and wet weather flows. In addition, a site was selected only if the site owner provided formal approval for installing or monitoring BMPs located within their right-of-way.

Using the above criteria, five sites were selected for this study. Three sites already have BMPs installed and operating. At two sites proprietary BMPs were installed in existing drain inlets by the vendor Kristar in December 2007 and January 2008, respectively. Table 6c summarizes selected BMP Pilot Study site locations and characteristics for monitoring. Figure 3b depicts the location of the BMP sites. The following sections provide a general description of each selected site. Attachment D provides photographs and additional field description information.

Table 6c
BMP Effectiveness Monitoring Program Site Characteristics

BMP Type	Site Name	Wet Weather Sampling	Dry Weather Sampling
Bioswale	Northern Bioswale Segment #1, City of Corona (BMP-BIO1)	X	X
Extended Detention Basin	Sycamore Canyon Wilderness Park, City of Riverside (BMP-EDB1)	X	X
Proprietary Device	Kristar Perk Filter, Site #1, City of Canyon Lake (BMP-PF1)	X	X
	Up-Flo Filter, Site #2, City of Canyon Lake (BMP-UF1)	X	X
	Contech StormFilter (BMP-SF1)	X	

5.2.1 Northern Bioswale Segment #1, City of Corona

The Northern Bioswale Segment No. 1 was constructed as part of the Dos Lagos commercial and residential development in the city of Corona, located south of Cajalco Road and east of Temescal Canyon Road.

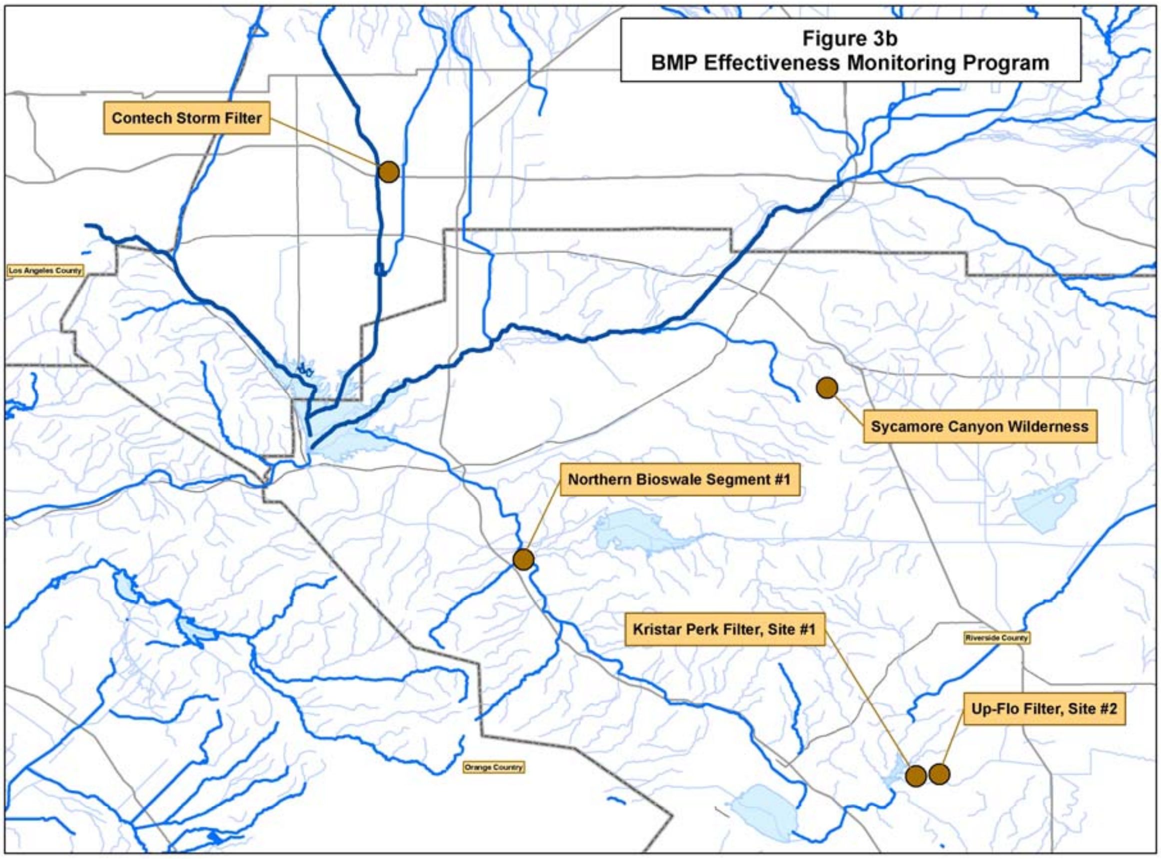

Figure 3b
BMP Effectiveness Monitoring Program

The contributing runoff area is approximately 130 acres which is comprised predominantly of commercial/office and residential land use. The commercial retail development lies west of Temescal Canyon Road. Temescal Canyon Properties owns and Dos Lagos Golf Course operates the golf course adjacent to the bioswale. Approximately two acres of the golf course contributes runoff to the bioswale.

The bioswale is approximately 2.21 acres in size and contains mature cattail, native grasses, and cottonwood. A headwall is located at the most western portion of the bioswale. Runoff enters the bioswale from a drainage pipe that runs under Temescal Canyon Road. Flows discharging from Northern Bioswale Segment No. 1 flow into the Northern Bioswale Segment No. 2 (0.26 acres) which then discharges to Bedford Wash, a tributary of Temescal Wash. Northern Bioswale Segment No. 2 is a relatively small sized bioswale and includes willow, cottonwood, and native grasses.

5.2.2 Extended Detention Basin, Sycamore Canyon Wilderness Park Extended Detention Basin, City of Riverside

The extended detention basin is owned by the City of Riverside and lies within Sycamore Canyon Wilderness Park. The park is located west of an industrial and commercial area in the southeast portion of the City. The extended detention basin receives drainage from approximately 620 acres of predominantly commercial and industrial land use. Approximately half of the 620 acre drainage area is developed; the remaining portion is yet to be developed. An expansive Ralphs food distribution facility and adjoining parking lot, located adjacent (east) to the detention basin, contributes to the runoff flowing into the extended detention basin.

The detention basin has been operational for approximately 14 years and has mature vegetative growth including large trees. The specific types of vegetation planted within the extended detention basin are not known at this time. During a site visit, steady continual dry weather flow was observed entering the inlet to the extended detention basin. A steady discharge was also observed flowing into the outlet riser structure of the detention basin. Discharge from the detention basin continues downstream via surface flows within the Sycamore Canyon Wilderness Park and eventually flows into Canyon Crest Country Golf Club.

The influent location is an approximate 18-inch pipe that conveys runoff to the extended detention basin. The effluent sampling location is an outfall pipe (8-inch) emerging from under a constructed spillway and is located downstream of the outflow riser structure.

5.2.3 Manufactured/ Proprietary Device BMPs

5.2.3.1 Kristar Perk Filter & Up-Flo Filter, City of Canyon Lake

Two drain inlets located within the jurisdiction of the City of Canyon Lake were selected for installation of Kristar Perk and Up-Flo Filters. The drain inlets are maintained by the Canyon Lake Property Owners Association (POA). The first drain inlet is located on Canyon Lake Drive North between Cross Hill Drive and Lands End Place and will be retrofitted with a Perk Filter. The second drain inlet is located on Canyon Lake Drive North near Outrigger Drive and will be retrofitted with an Up-Flo Filter. Kristar installed and is maintaining the two BMPs for the duration of the BMP Effectiveness Monitoring Program.

Both drain inlets receive continual dry weather flow from rising groundwater located upstream of the drain inlets. The high groundwater levels, which the City has indicated are natural springs and the primary source of dry weather runoff, create surface ponds on residential properties.

For each device, influent samples will be collected from the street curb gutter upgradient from the retrofitted drain inlets. Effluent samples will be collected by removing the manhole access for the drain inlets and taking a sample downstream of filtration cartridges for the Perk Filters and Up-Flo Filter units.

5.2.3.2 Contech StormFilter

A StormFilter unit was installed in a parking lot for three commercial office buildings at 2850 E. Inland Empire Boulevard in the City of Ontario in 2005. The unit receives runoff from approximately 1.15 acres.

The StormFilter unit is a 6′ x 8′ pre-cast vault unit with five (5) Perlite media cartridges. The Perlite media is a naturally occurring puffed volcanic ash, which is designed to remove suspended solids and oil & grease. Few research data are available regarding the ability of the StormFilter unit to remove or kill bacteria. Sampling at this site will be conducted only during wet weather conditions. Samples will be collected in the gutter upgradient of the drain inlet. Effluent samples will be collected by removing the manhole access for the drain inlets and taking a sample downstream of the Perlite media cartridges.

The owners of the commercial property have agreed to participate in the monitoring program and signed sampler access agreements. Contech will initiate a separate maintenance contract with the owners of the property to maintain the StormFilter for the duration of the project.

5.3 Sample Frequency

Table 6d provides a detailed schedule for monitoring activities at BMP Effectiveness Monitoring sites. The following sections describe sample collection during dry and wet weather and the number of samples to be collected during each sample event.

5.3.1 Sample Type

Wet Weather [3]: Two wet weather events will be sampled between January 1 and March 31, 2008, as described below.

For the purposes of this Monitoring Plan, the decision whether to conduct wet weather sampling will be approached by implementing the following steps: (1) prepare to deploy the sampling team if rain is forecasted (National Weather Service forecast on Accuweather.com), i.e., the sample teams are put on stand-by; (2) if rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and (3) mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so that they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

Limiting mobilization to first daylight regardless of when rainfall begins, addresses two requirements: (1) For safety purposes, sampling may only be conducted during daylight hours; and (2) samples must be dropped off at the laboratory no later than

[3] If no wet weather events occur prior to March 31, TMDL Task Force may consider approval for an extended wet weather period to increase opportunity for sampling wet weather events. Alternatively, the TMDL Task Force may decide to replace planned wet weather sampling events with dry weather events (e.g., change the planned 3 dry events to 5 dry events). If changed to all dry weather events, then all dry weather sampling protocols would apply.

1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on- site assessment conducted by the field team leader.

Table 6d. BMP Effectiveness Monitoring Sample Frequency/Schedule for Proposed Sample Sites

Sample Period (January 1 to June 15, 2008) — Storm Event 1 Sampling

	Site Location	Influent 1 + Effluent 1	Influent 2 + Effluent 2	Influent 3 + Effluent 3	Influent 4 + Effluent 4	Influent 5 + Effluent 5	Influent 6 + Effluent 6	Influent 7 + Effluent 7	Influent 8 + Effluent 8	Influent 9 + Effluent 9	Influent 10 + Effluent 10
		W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1
BMP Effectiveness Monitoring	Northern Bioswale Segment #1, City of Corona (BMP-BIO1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Extended Detention Basin, Sycamore Canyon Wilderness Park, City of Riverside (BMP-EDB1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Kristar Perk Filter, Site #1, City of Canyon Lake (BMP-PF1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Up-Flo Filter, Site #2, City of Canyon Lake (BMP-UF1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Contech StormFilter, City of Ontario (BMP-SF1) [3]	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C
	Sample Number (CDM)	0	0	0	0	0	0	0	0	0	0
	Sample Number (B&C)	10	10	10	10	10	10	2	2	2	2

Sample Period (January 1 to June 15, 2008) — Storm Event 2 Sampling

	Site Location	Influent 1 + Effluent 1	Influent 2 + Effluent 2	Influent 3 + Effluent 3	Influent 4 + Effluent 4	Influent 5 + Effluent 5	Influent 6 + Effluent 6	Influent 7 + Effluent 7	Influent 8 + Effluent 8	Influent 9 + Effluent 9	Influent 10 + Effluent 10
		W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1
BMP Effectiveness Monitoring	Northern Bioswale Segment #1, City of Corona (BMP-BIO1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Extended Detention Basin, Sycamore Canyon Wilderness Park, City of Riverside (BMP-EDB1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Kristar Perk Filter, Site #1, City of Canyon Lake (BMP-PF1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Up-Flo Filter, Site #2, City of Canyon Lake (BMP-UF1)	B & C	B & C	B & C	B & C	B & C	B & C	--	--	--	--
	Contech StormFilter, City of Ontario (BMP-SF1) [3]	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C	B & C
	Sample Number (CDM)	0	0	0	0	0	0	0	0	0	0
	Sample Number (B&C)	10	10	10	10	10	10	2	2	2	2

Dry Season (April 1 to June 15, 2008)

	Site Location	Dry Event 1 Sampling						Dry Event 2 Sampling						Dry Event 3 Sampling						
		Influent 1 + Effluent 1	Influent 2 + Effluent 2	Influent 3 + Effluent 3	Influent 4 + Effluent 4	Influent 5 + Effluent 5	Influent 6 + Effluent 6	Influent 1 + Effluent 1	Influent 2 + Effluent 2	Influent 3 + Effluent 3	Influent 4 + Effluent 4	Influent 5 + Effluent 5	Influent 6 + Effluent 6	Influent 1 + Effluent 1	Influent 2 + Effluent 2	Influent 3 + Effluent 3	Influent 4 + Effluent 4	Influent 5 + Effluent 5	Influent 6 + Effluent 6	
		W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	W 1	
BMP Effectiveness Monitoring	Northern Bioswale Segment #1, City of Corona (BMP-BIO1)	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	
	Extended Detention Basin, Sycamore Canyon Wilderness Park, City of Riverside (BMP-EDB1)	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	
	Kristar Perk Filter, Site #1, City of Canyon Lake (BMP-PF1)	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	
	Up-Flo Filter, Site #2, City of Canyon Lake (BMP-UF1)	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	C D M	
	Contech StormFilter, City of Ontario (BMP-SF1) [3]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Total
	Sample Number (CDM)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	144
	Sample Number (B&C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136

CDM = Camp Dresser & McKee; Brown & Caldwell (B&C)

1 Collection of water quality samples for laboratory analysis (Fecal coliform, E. coli and TSS), field parameter data (temperature, dissolved oxygen, turbidity, pH, and conductivity), or for pathogen scoping study. Samples collected by CDM and Brown & Caldw

2 For a sample events, effluent samples are collected factoring a lag time after its paired influent sample is collected.

3 No dry weather flows at Contech Stormfilter.

Dry Weather: Dry weather flow samples will be collected during three sample events between April 1 and June 15, as described below. Dry weather sampling will occur only at the following BMP sites, where dry weather flows have been observed:

- Northern Bioswale Segment #1, Corona
- Extended Detention Basin, Sycamore Canyon Wilderness Park
- Kristar Perk Filter, Canyon Lake
- Up-Flo Filter, Canyon Lake

5.3.2 Influent & Effluent Sampling

A total of 30 influent and 30 effluent samples will be collected from the following sites: Northern Bioswale Segment #1, Corona; Extended Detention Basin, Sycamore Canyon Wilderness Park; Kristar Perk Filter, Canyon Lake; and Up-Flo Filter, Canyon Lake. A total of 20 influent and 20 effluent samples will be collected from the StormFilter site.

During each wet and dry weather sampling event, samples will be collected from the influent and effluent associated with each BMP site, as described in the following sections:

Influent Sampling: Six grab samples will be collected at the influent sampling point for each BMP site, with exception of the Contech StormFilter (Ontario) site. For the StormFilter site, ten grab samples will be collected at the influent sampling point. None of the samples will be composited.

After the first sample is collected, each of the successive influent samples will be collected after 10 minutes of time has elapsed. For the Contech StormFilter site, samples will be collected after 6 minutes of elapsed time.

Effluent Sampling: Six grab samples will be collected at the effluent sampling point for each BMP site, with exception of the Contech StormFilter (Ontario) site. For the StormFilter site, ten grab samples will be collected at the effluent sampling point. None of the samples will be composited.

After the first sample is collected, each of the successive effluent samples will be collected after 10 minutes of time has elapsed. For the Contech StormFilter site, samples will be collected after 6 minutes of elapsed time.

With the exception of Extended Detention Basin site, the timing of the collection of the first and subsequent effluent samples is generally based on a transit or “lag” time that is unique to the site. That is, influent water will have an expected lag time during which the BMP "treats" the water. If the lag time is correctly estimated, then the effluent sample result can be paired with the influent sample result to provide paired sample results showing water quality characteristics before and after treatment. The estimation of lag time is based on the hydraulic characteristics of the BMP as either measured in the field or as provided by the proprietor of the treatment device. Information provided below describes the basis for the lag time estimated for each site and the expected timing of the collection of each effluent sample.

Although, to the extent practical, effluent samples will be linked to influent samples, practical considerations such as the ability to meet holding times and safety will have to be taken into account when attempting to sample effluent according to estimated lag times. For example, if the lag time is too long such that the 6-hour holding time for indicator bacteria would be compromised, then the timing of the collection of the effluent sample will be adjusted according to runoff conditions. The decision regarding when to collect effluent samples at a particular site will be made in the field. The basis for the decision will be documented on the data collection forms.

Northern Bioswale No.1, Corona - Lag time is based on the depth of water at the influent sampling point (Table 6e). The depth measurement to lag (travel) time relationship was established by applying Mannings Equation and evaluating flows of differing depths. A depth measurement will be performed when collecting the first influent grab sample. Based on the depth, Table 6e provides the corresponding lag time before the first effluent sample is to be collected. During dry weather, flows are expected to be relatively uniform and only one depth measurement to determine the lag time is necessary. However, during wet weather, a depth measurement should be made during the collection of each influent sample to make sure that the lag time has not changed.

Extended Detention Basin in Sycamore Canyon Wilderness Park, Riverside - When collecting the effluent sample at the Extended Detention Basin in Sycamore Canyon Wilderness Park, a lag time will not be incorporated into the sampling protocol since this BMP is a volume-based BMP with very long lag times (in hours). Samples will be collected at the effluent sample location after influent samples have been collected.

Kristar Perk Filter and Up-Flo Filter, Canyon Lake - To determine the lag time, an estimated flow measurement will be made at the street gutter prior to the flow entering the drain inlet. Figure 3c provides the lag time for collection of the effluent samples based the flow measurements for the Kristar Perk Filter and Up-Flo Filter. For dry weather only one flow measurement is necessary. However, for wet weather

Table 6e. Lag Time between Influent and Effluent Sample Collection Based on Depth at the Influent Sample Point	
Northern Bioswale No.1 (Corona)	
Depth (ft)	Lag Time (min)
0.5	40
1	25
1.5	19
2	16
2.5	14
3	12
3.5	11
4	10
4.5	9
5	9

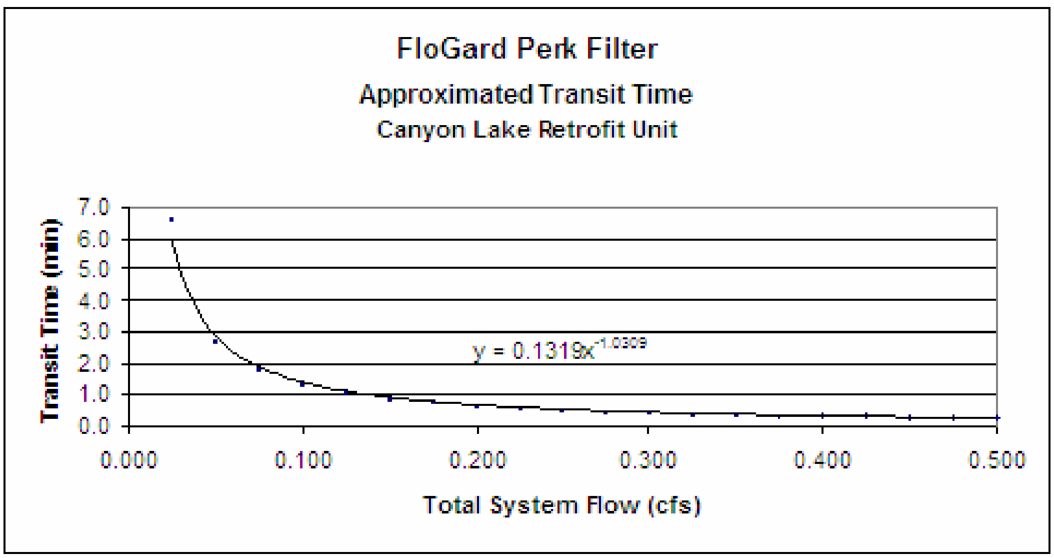

Figure 3c. Relationship between Transit Time and Total System Flow – Perk Filter/ Up-Flo Filter

flow measurements will be made when each influent sample is collected to verify that flow has not changed markedly.

Contech StormFilter, Ontario - When collecting effluent samples for the Contech StormFilter (Ontario), runoff flow conditions at the site determine the timing of collecting effluent samples. When at least 140 cubic feet (CF) of stormwater fills the filter cartridge chamber, the filter cartridges will continually siphon water and discharge treated effluent. Under this condition, a lag time of 14 minutes will be observed prior to collection of the effluent sample.

Depending on rain intensity and flow conditions, if less than 140 CF of stormwater has filled the filter cartridge chamber, effluent will be intermittently discharging from the outlet chamber. Under this condition, samplers will collect effluent as soon as possible in order to collect enough required sample volume.

Section 6
Procedures for Field Activities

6.1 Pre-Sampling Procedures

Prior to the collection of field data, the sample teams will complete the following activities:

6.1.1 A Horiba multi-parameter instrument should be calibrated every morning prior to sampling (See the equipment operation manual for specific calibration instructions).

6.1.2 Prepare ice coolers with ice packs or crushed ice to transport samples to the laboratory.

6.1.3 Obtain sample containers from labs, including field blanks and water collection bottles

6.1.4 Pre-labeled sampling containers with Site Identification Number (Site ID), sample Identification Number (Sample ID), analysis information, Project Identification Number (Project ID), and blank fields for date and time.

6.1.5 Prepare 70 percent ethanol solution for field sterilization of sampling equipment.

6.1.6 Pack the Hach Portable Turbidity Meter.

6.1.7 Pack a flat head screw driver to loosen the band that holds the sampling bottle to the sampling pole.

6.1.8 Pack safety gear such as waders, protective gloves, and safety vests.

6.1.9 Pack waterproof pen and field log book.

6.1.10 Make sure that a vehicle is available and fueled.

6.1.11 Pack supplies for shipping samples.

6.1.12 Pack chain of custody forms, field data sheets, camera, and zip lock bags.

6.2 Field Documentation

Field crews are required to complete a form with data from each site visit (Attachment E). The form includes the following items that must be recorded for each sampling event at each sample location:

6.2.1 Date and time of sample collection

6.2.2 Project, Site, and Sample ID numbers

6.2.3 Unique IDs for any replicate or blank samples collected from the site

6.2.4 The results of any field measurements (temperature, dissolved oxygen, pH, conductivity, turbidity) and the time that measurements were made

6.2.5 Qualitative descriptions of relevant water conditions (e.g. color, flow level, clarity) or weather (e.g. wind, rain) at the time of sample collection

6.2.6 For USEP sites when such characterizations are required, a characterization of the hydrologic connectivity of the surface flow at the site to the downstream impaired water to which it is tributary. If no connectivity is observed, then the characterization shall, at a minimum, describe the general distance between the point where surface flow ceases and the channel confluences with the downstream impaired water. If connectivity is observed, then the characterization shall, at a minimum, describe the typical width and depth of the surface flow reaching the downstream impaired water, and any observations that suggest that flows have recently been higher than what is currently observed.

6.2.7 A description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality

Field crews are required to take digital photographs during each sampling event at each site and maintain a photo log of all photographs taken. At a minimum, the following digital photographs should be taken during each sampling event:

6.2.8 A photograph which shows a view of the waterbody upstream of the sample site

6.2.9 A photograph which shows a view of the waterbody downstream of the sample site.

6.2.10 Photographs which characterize the width and depth of flow and aesthetic characteristics such as water clarity and algal growth

To the extent possible, the photographs that provide an upstream and downstream view of the waterbody should be taken from the same point during each sample event.

A photo log of all photographs taken at each sample site shall be maintained, which documents the purpose of the photo (for example, upstream or downstream view) and the date and time of the photograph.

6.3 Sample Collection

Water samples are best collected before any other work is done at the site. If other work is done prior to the collection of water samples (for example, flow measurement or other field measurements), it might be difficult to collect representative samples for water chemistry and bacteria analysis from the disturbed stream.

For the Watershed-wide and USEP Monitoring Programs, water samples are collected from a location in the stream (or storm drain in the case of AgSEP program) where the stream visually appears to be completely mixed. Ideally this would be at the centroid of the flow (*Centroid* is defined as the midpoint of that portion of the stream width that contains 50% of the total flow), but depth and flow do not always allow centroid collection. In addition, the sample should be collected in an area free of debris or algae. For BMP Effectiveness Monitoring Program, the water samples will be collected at the influent and effluent location of the BMPs (as described in Section 5.3.2).

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment by the field team leader.

For sites where the samples will be taken from a distance, a sampling pole similar to that shown in Figure 4 will be used. This sampling pole is approximately 7 feet long and has a mechanism that holds the sampling bottle in place, as shown in Figure 5. The mechanism should be sterilized in the field with a 70 percent ethanol solution prior to the collection of each sample. Allow the pole to air-dry before the sample is taken. A similar sampling pole that extends to greater height may be used for sites where sampling from a bridge is necessary.

The following lists contain specific steps to take when collecting a water sample (adapted from EPA's Volunteer Stream Monitoring: A Methods Monitoring Manual, EPA 841-B-97-003, 1997 and California's SWAMP Quality Assurance Management Plan, Puckett, 2002):

6.3.1 Label each container with Site ID, Sample ID, analysis information, Project ID, date, and time (some of this information may be pre-labeled on the containers). After sampling, secure the label by taping it around the bottle with clear packaging tape.

6.3.2 When wading (if applicable) to the sampling point, try not to disturb bottom sediment.

6.3.3 Stand in the water, facing upstream. Collect the water sample on your upstream side, in front of you. Hold the bottle upright under the surface while it is still capped. Open the lid carefully to slowly let water run in. Avoid touching the inside of the bottle or cap. If you accidentally touch the inside, use another bottle. Fill the bottle leaving a 1-inch air space so that the sample can be shaken just before analysis.

Figure 4
Sampling Pole

Figure 5
Close-up of Sampling Pole

6.3.4 For fecal coliform and *E. coli* samples, the bottle will contain sodium thiosulfate for chlorine elimination; therefore, the bottle cannot be held under the water to collect a sample. Therefore, use a new sterilized water collection bottle to collect water for these parameters at each site. Water can then be decanted from this bottle into the preserved sample container for the delivery to the laboratory.

6.3.4.1 The TSS sample containers will be sterilized by the lab so that they can be used for collection and decanting of water into the preserved fecal coliform and *E. coli* sample bottle.

6.3.5 The sampler may also tape the bottle to an extension pole to sample from deeper water. The sampling pole will be cleaned with a 70% ethanol solution prior to use at each sample site.

6.3.6 Place the sample containers in a cooler with cold packs for transport to the laboratory. **The maximum holding time prior to water quality analysis for bacteria indicator concentrations is 6 hours; the maximum holding time prior to *Bacteroides* analysis is 24 hours**. Sampling bottles and parameter specific sample containers will be provided by the laboratories for each sample and will include:

6.3.6.1 Water Quality Analysis Laboratory – 120 mL for fecal coliform and *E. coli*, and 1 liter for TSS

6.3.6.2 OCWD or University of California-Davis Laboratory – 1 liter bottles for *Bacteroides* analysis

6.3.7 Field QA Samples

6.3.7.1 *Field Equipment Blanks* – One set of field equipment blank samples (equal volume for each constituent) is to be included for each sample event. Sterile deionized water is poured through any equipment used to collect the fecal coliform and *E.coli* sample at the site where the field equipment blank is being collected and then into the 120 mL fecal coliform and *E. coli* sample bottle. For the TSS field equipment blank, distilled water is poured through any equipment used to collect the TSS sample at the site where the field equipment blank is being collected and then into the 1 liter TSS sample bottle. If no equipment is used to collect the TSS sample, then the distilled water is poured directly into the 1 liter TSS sample bottle. The site selected for collection of a field equipment blank is shown in Table 7, Table 7a, and Table 7b for each of the monitoring programs.

6.3.7.2 *Field Replicates* – Field replicates will be collected at one site for every ten sites visited during one sample event. If less than 10 sites are visited in a day, then 1 field replicate is taken from one site. The site selected for collection of a field replicate is shown in Table 7, Table 7a, and Table 7b for each of the monitoring programs. Field replicates are taken by collecting two sets of samples at the same location within five minutes of each other.

Table 7
Schedule for Collection of Field Replicate and Field Equipment Blank Water Samples
Watershed-Wide and USEP Monitoring Program

Sample Week Ending Date	Watershed-Wide	USEP
7/14/2007	Icehouse Canyon Creek	
7/21/2007	Prado Park Lake at Lake Outlet	
7/28/2007	Chino Creek at Central Avenue	Santa Ana River Reach 3 at La Cadena Drive
8/4/2007	Mill Creek at Chino-Corona Road	Box Springs Channel at Tequesquite Avenue
8/11/2007	Santa Ana River Reach 3 at Pedley Avenue	Sunnyslope Channel near confluence with SAR
8/18/2007	Santa Ana River Reach 3 at MWD Crossing	Anza Park Drain near confluence with Effluent Channel
8/25/2007	Icehouse Canyon Creek	San Sevaine Channel near confluence with SAR
9/1/2007	Prado Park Lake at Lake Outlet	
9/8/2007	Chino Creek at Central Avenue	
9/15/2007	Mill Creek at Chino-Corona Road	
9/22/2007	Santa Ana River Reach 3 at Pedley Avenue	Day Creek at Lucretia Avenue
9/29/2007	Santa Ana River Reach 3 at MWD Crossing	Temescal Wash at Lincoln Avenue
10/6/2007	Icehouse Canyon Creek	Cypress Channel at Kimball Avenue
10/13/2007	Prado Park Lake at Lake Outlet	San Antonio Channel at Walnut Avenue
10/20/2007	Chino Creek at Central Avenue	Carbon Canyon Creek Channel at Pipeline Avenue
12/15/2007	Chino Creek at Central Avenue	
12/22/2007	Mill Creek at Chino-Corona Road	
12/29/2007	Santa Ana River Reach 3 at Pedley Avenue	
1/5/2007	Santa Ana River Reach 3 at MWD Crossing	
1/12/2007	Icehouse Canyon Creek	
1/19/2007	Prado Park Lake at Lake Outlet	Chris Basin Outflow (Lower Deer Creek)
1/26/2007	Chino Creek at Central Avenue	County Line Channel at Cucamonga Creek confluence
2/2/2007	Mill Creek at Chino-Corona Road	Cucamonga Creek at Hwy 60 (Above RP1)
2/9/2007	Santa Ana River Reach 3 at Pedley Avenue	Santa Ana River Reach 3 at La Cadena Drive
2/16/2007	Santa Ana River Reach 3 at MWD Crossing	Box Springs Channel at Tequesquite Avenue
2/23/2007	Icehouse Canyon Creek	Sunnyslope Channel near confluence with SAR
Storm 1	Prado Park Lake at Lake Outlet	Anza Park Drain near confluence with Effluent Channel
Storm 1 + 48hrs	Chino Creek at Central Avenue	San Sevaine Channel near confluence with SAR
Storm 1 + 72hrs	Mill Creek at Chino-Corona Road	Day Creek at Lucretia Avenue
Storm 1 + 96 hrs	Santa Ana River Reach 3 at Pedley Avenue	Temescal Wash at Lincoln Avenue
5/17/2008	Mill Creek at Chino-Corona Road	
5/24/2008	Santa Ana River Reach 3 at Pedley Avenue	
5/31/2008	Santa Ana River Reach 3 at MWD Crossing	
6/7/2008	Icehouse Canyon Creek	
6/14/2008	Prado Park Lake at Lake Outlet	

Table 7a
Schedule for Collection of Field Replicate and Field Equipment Blank Water Samples
AgSEP Monitoring Program

Storm Event No.	AgSEP
Storm 1	Euclid Avenue Channel at Pine Avenue (AG-E2)
Storm 1 + 30 min	Grove Avenue Channel at Merrill Avenue (AG-G2)
Storm 2	Eucalyptus Avenue at Walker Avenue (AG-G1)
Storm 2 + 30 min	Cypress Channel at Kimball Avenue (AG-CYP1)

Table 7b
Schedule for Collection of Field Replicate and Field Equipment Blank Water Samples
BMP Effectiveness Monitoring Program

Event No.	Field Equipment Blank	Field Replicate
Wet Weather		
Storm 1, Influent 1	Northern Bioswale Segment #1, City of Corona (BIO1)	Northern Bioswale Segment #1, City of Corona (BIO1)
Storm 1, Influent 1	-NA-	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)
Storm 1, Influent 1	-NA-	Up-Flo Filter, City of Canyon Lake (UF1)
Storm 2, Influent 1	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)	StormFilter, Ontario (SF1)
Storm 2, Influent 1	-NA-	Northern Bioswale Segment #1, City of Corona (BIO1)
Storm 2, Influent 1	-NA-	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)
Dry Weather		
Dry Event 1, Influent 1	Up-Flo Filter, City of Canyon Lake (UF1)	Up-Flo Filter, City of Canyon Lake (UF1)
Dry Event 1, Influent 1	-NA-	StormFilter, Ontario (SF1)
Dry Event 1, Influent 1	-NA-	Northern Bioswale Segment #1, City of Corona (BIO1)
Dry Event 2, Influent 1	Northern Bioswale Segment #1, City of Corona (BIO1)	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)
Dry Event 2, Influent 1	-NA-	Up-Flo Filter, City of Canyon Lake (UF1)
Dry Event 2, Influent 1	-NA-	Northern Bioswale Segment #1, City of Corona (BIO1)
Dry Event 3, Influent 1	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)	Extended Detention Basin, Sycamore Canyon Wilderness Park (EDB1)
Dry Event 3, Influent 1	-NA-	Up-Flo Filter, City of Canyon Lake (UF1)
Dry Event 3, Influent 1	-NA-	StormFilter, Ontario (SF1)

6.4 Sample Handling and Custody

Proper gloves must be worn to prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended). Wear at least one layer of gloves, but two layers help protect against leaks. One layer of shoulder high gloves worn as first (inside) layer is recommended to have the best protection for the sampler. Safety precautions are needed when collecting samples, especially samples that are suspected to contain hazardous substances, bacteria, or viruses.

Properly store and preserve samples as soon as possible. Usually this is done immediately after returning from the collection by placing the containers on bagged, crushed or cube ice in an ice chest. Sufficient ice will be needed to lower the sample temperature to at least 4°C within 45 minutes after time of collection. Sample temperature will be maintained at 4°C until delivered to the appropriate laboratory. Care should be taken at all times during sample collection, handling, and transport to prevent exposure of the sample to direct sunlight.

Samples that are to be analyzed for bacteria indicators must be kept on ice or in a refrigerator and delivered to **Orange County Health Care Agency Water Quality Laboratory, (700 Shellmaker Road, Newport Beach, CA, 92660; 949-219-0423)** water quality laboratory within 6 hours. Samples analyzed for *Bacteroides* must be kept on ice or in a refrigerator and delivered to the appropriate laboratory, **Orange County Water District laboratory (10500 Ellis Avenue, Fountain Valley, CA, 92708; 714-378-3313, contact Menu Leddy) *or* University California Davis laboratory (University of California, Department of Civil & Environmental Engineering, One Shields Avenue, Davis, CA 95616, 3157 Engineering III; 530-754-6407, contact Dr. Stefan Wuertz)** within 24 hours of collection. A detailed sample delivery schedule is presented in Table 3 of this Monitoring Plan. Every shipment must contain a complete Chain of Custody (COC) Form (see Attachment F) that lists all samples taken and the analyses to be performed on these samples. COCs must be completed every time samples are transported to a laboratory. Include any special instructions to the laboratory. The original COC sheet (not the copies) is included with the shipment (insert into zip lock bag); one copy goes to the sampling coordinator; and the sampling crew keeps one copy. Samples collected should have the depth of collection and date/time collected on every COC.

Due to increased shipping restrictions, samples being sent via a freight carrier require additional packing. Although care is taken in sealing the ice chest, leaks can and do occur. Samples and ice should be placed inside a large plastic bag inside the ice chest for shipping. The bag can be sealed by simply twisting the bag closed (while removing excess air) and taping the tail down. Prior to shipping the drain plug of the ice chests have to be taped shut. Leaking ice chests can cause samples to be returned or arrive at the laboratory beyond the required holding time. Although glass containers are acceptable for sample collection, bubble wrap must be used when shipping glass.

6.5 Field Measurements

After collecting the water samples, record the water temperature, pH, conductivity, turbidity, and dissolved oxygen concentration. These parameters as well as other field data are measured and recorded using a YSI or equivalent probe. When field measurements are made with a multi-parameter instrument, it is preferable to place the sonde in the body of water to be sampled and allow it to equilibrate in the dissolved oxygen mode while water samples are collected. Field measurements are made at the centroid of flow, if the stream visually appears to be completely mixed from shore to shore. For routine field measurements, the date, time and depth are reported as a grab. To provide QA/QC of field instruments and sampling personnel, three replicates of each field measurement will be collected at 10 percent of the sites for each sampling event. The site for replication of field measurements will be selected randomly for each day of sampling. Below is a brief discussion of each recorded field measurement (California SWAMP Procedures for Conducting Routine Field Measurements):

6.5.1 Dissolved Oxygen - Calibrate the dissolved oxygen sensor on the multi-probe instrument at the beginning of each day of field measurements. Preferably, dissolved oxygen is measured directly in-stream close to the flow centroid. The dissolved oxygen probe must equilibrate for at least 90 seconds before dissolved oxygen is recorded to the nearest 0.1 mg/L. Since dissolved oxygen takes the longest to stabilize, record this parameter after temperature, conductivity, and pH.

6.5.2 pH - If the pH meter value does not stabilize in several minutes, out-gassing of carbon dioxide or hydrogen sulfide or the settling of charged clay particles may be occurring. If out-gassing is suspected as the cause of meter drift, collect a fresh sample, immerse the pH probe and read pH at one minute. If suspended clay particles are the suspected cause of meter drift, allow the sample to settle for 10 minutes, and then read the pH in the upper layer of sample without agitating the sample. With care, pH measurements should be accurately measured to the nearest 0.1 pH unit

6.5.3 Conductivity - Preferably, specific conductance is measured directly in-stream close to the flow centroid. Allow the conductivity probe to equilibrate for at least one minute before specific conductance is recorded to three significant figures (if the value exceeds 100 mS/cm). The primary physical problem in using a specific conductance meter is entrapment of air in the conductivity probe chambers. The presence of air in the probe is indicated by unstable specific conductance values fluctuating up to ±100 mS/cm. The entrainment of air can be minimized by slowly, carefully placing the probe into the water; and when the probe is completely submerged, quickly move it through the water to release any air bubbles.

6.5.4 Temperature is measured directly in-stream close to the flow centroid. Measure temperature directly from the stream by immersing a YSI instrument.

6.5.5 Measure turbidity by collecting a sample close to the stream centroid to be used in a Hach Portable Turbidity Meter. The glass sample container must be wiped with a soft cloth before placing into the turbidity meter for analysis. Be careful not to scratch the glass sample container as this will impact the turbidity meters accuracy.

6.6 Instantaneous Flow Monitoring

Flow measurements will be recorded by field personnel for every Watershed-wide, USEP, and AgSEP site visit (when safe).

For the BMP Effectiveness Monitoring Program, flow measurements will be made using the Visual Flow Estimate (Section 6.6.4).

A depth-discharge rating curve can be developed by conducting multiple flow measurements at water depths in 0.1 ft increments. Once developed, only depth measurements would be required during site visits, assuming the depth of flow is within 0.1 ft of a previously completed flow measurement.

6.6.1 Volumetric Flow Estimate

Where possible, a volumetric flow measurement approach will be used. This method shall not be used if conditions are determined to be unsafe by an on-site assessment by the field team leader. A volumetric flow measurement entails estimation of the time in seconds (t) required to fill a 5 gallon bucket with concentrated runoff. Sites with low flow and a free outfall would allow for this type of flow measurement. The following equation would then give the flow rate for a test with one 5-gallon bucket of volume captured, Q (cfs) = 0.67 * t. If there are multiple points where runoff is concentrated, then volumetric measurements can be made at each point along the stream and summed to provide total discharge.

6.6.2 Cross-Section Velocity Profile Flow Measurement

The following steps guide the development of a velocity profile for a streamflow cross section. This approach will require that the field personnel be equipped with a Marsh-McBirney Electronic meter or equivalent, top-setting wading rod (preferably measured in tenths of feet) (Figure 6), and a tape measure. This method shall not be used if conditions for wading are determined to be unsafe by an on-site assessment by the field team leader.

6.6.2.1 The measuring tape across the stream at right angles to the direction of flow. When using an electronic flow meter, the tape does not have to be exactly perpendicular to the bank (direction of flow). Avoid measuring flow in areas with back eddies. The first choice would be to select a site with no back eddy development. However, this cannot be avoided in certain situations. Measure the negative flows in the areas with back eddies.

6.6.2.2 Record the following information on the flow measurement form (Attachment E):

6.6.2.2.1 Site Location and Site ID

6.6.2.2.2 Date

6.6.2.2.3 Time measurement is initiated and ended

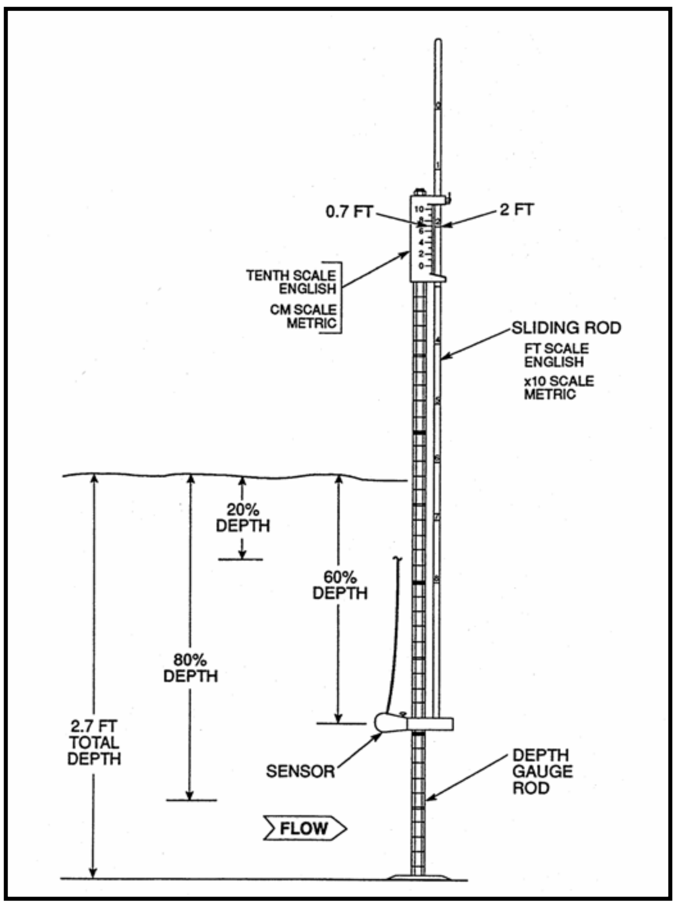

Figure 6

Top-Setting Wading Rod

Source: California's SWAMP Quality Assurance Project Plan, Appendix E, December 2002

6.6.2.2.4 Name of person(s) measuring flow

6.6.2.2.5 Note if measurements are in feet or meters

6.6.2.2.6 Total stream width and width of each measurement section

6.6.2.2.7 For each measurement section, record the mid-point, section depth, and flow velocity

6.6.2.3 Determine the spacing and location of flow measurement sections. Measurements will be taken at the midpoint of each of the flow measurement sections. Flow measurements will be taken at the following locations, as shown in Figure 7.

6.6.2.3.1 A point from the left bank representing 10% of the total width. This measurement will provide a velocity estimate for the section representing 0 % – 20% of the total width from the left bank;

6.6.2.3.2 A point from the left bank representing 50% of the total width. This measurement will provide a velocity estimate for the section representing 20 % – 80% of the total width from the left bank;

6.6.2.3.3 A point from the left bank representing 90% of the total width. This measurement will provide a velocity estimate for the section representing 80 % – 100% of the total width from the left bank;

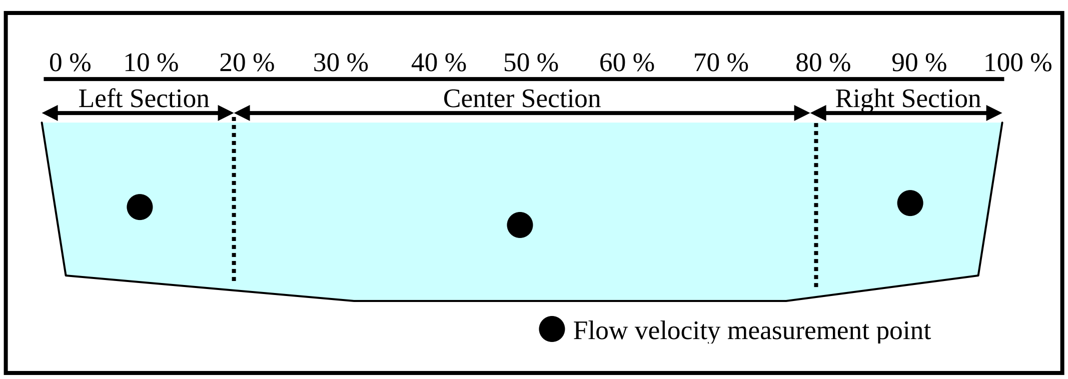

Figure 7
Approach Used in Cross Section Velocity Profile Flow Measurements

6.6.2.4 Place the top setting wading rod at each flow measurement point.

6.6.2.5 Using a tape measure, measure the depth of water to the nearest ½ inch.

6.6.2.6 Adjust the position of the sensor to the correct depth at each flow measurement point. The purpose of the top setting wading rod is to allow the user to easily set the sensor at 20%, 60%, and 80% of the total depth. On the wading rod, each single mark represents 0.10 foot, each double mark represents 0.50 foot, and each triple mark represents 1.00 foot (Figure 6). Position the meter at 60% of the total depth from the water surface (if depth of flow is greater than 2.5ft, then take two readings, at 20% and 80% of total depth).

6.6.2.7 Measure and record the velocity and depth. The wading rod is kept vertical and the flow sensor kept perpendicular to the cross section. Permit the meter to adjust to the current for a few seconds. Measure the velocity for a minimum of 20 seconds with the Marsh-McBirney meter. When measuring the flow by wading, stand in the position that least affects the velocity of the water passing the current meter. The person wading stands a minimum of 1.5 feet downstream and off to the side of the flow sensor.

6.6.2.8 Report flow values less than 10 ft^3/s to two significant figures. Report flow values greater than 10 ft^3/s to the nearest whole number, but no more than three significant figures.

6.6.2.9 Calculate flow by multiplying the width x depth (ft^2) to derive the area of each of the three flow measurement sections. The area of the section is then multiplied by the velocity (ft/s) to calculate the flow in cubic feet per second (cfs or ft^3/sec) for each flow measurement section. Do not treat cross sections with negative flow values as zero. Negative values obtained from areas with back eddies should be subtracted during the summation of the flow for a site. When flow is calculated for all of the measurement sections, they are added together for the total stream flow.

6.6.3 Visual Flow Estimate

Flow estimate data may be recorded for a non-tidally influenced stream when it is not possible to measure flows by the volumetric or cross section velocity profile methods described above either because flows are too high or so shallow that obtaining a velocity measurement is difficult or impossible. Visual flow estimates are subjective measures based on field personnel's experience and ability to estimate distances, depths, and velocities.

6.6.3.1 Observe the stream and choose a reach of the stream where it is possible to estimate the stream cross section and velocity. Estimate stream width (feet) at that reach and record.

6.6.3.2 Estimate average stream depth (feet) at that reach and record.

6.6.3.3 Estimate stream velocity (ft/s) at that reach and record. A good way to do this is to time the travel of a piece of floating debris. This can be done by selecting points of reference along the stream channel which can be used as upper and lower boundaries for an area of measurement. After establishing the boundaries, measure the length of the flow reach. One person stands at the upper end of the reach and drops a floating object and says “start.” A second person stands at the lower end of the reach and times the number of seconds for the floating object to float the reach. This measurement is conducted three times and the three results are averaged. The velocity is the length of the reach in feet divided by the average time in seconds.

6.6.3.4 If doing this method from a bridge (for example, because flows are too high to be in the channel), measure the width of the bridge. Have one person drop a floating object (something that can be distinguished from other floating material) at the upstream side of the bridge and say “start”. The person on the downstream side of the bridge will stop the clock when the floating object reaches the downstream side of the bridge. Divide the bridge width by the number of seconds to calculate the velocity. The velocity should be measured at multiple locations along the bridge at least three times. These velocities are averaged.

6.6.3.5 Multiply stream width (feet) by average stream depth (feet) to determine the cross sectional area (ft^2) which when multiplied by the stream velocity (ft/s) and a correction constant, gives an estimated flow (ft^3/s).

6.7 Personnel and Training

Prior to the start of sampling, a day of training will be held to instruct the sampling team on appropriate sample collection methods. All field sampling teams will attend this training.

Water quality samples for the Watershed-Wide Monitoring Program will be collected by **San Bernardino County Flood Control District staff (Contact: Janet Dietzman, 825 East Third Street, San Bernardino, Ca 92415 Phone 909-387-8109)**. One team of two will collect water samples from the six sites over the course of two days. Preferably, the same sites will be visited on the same day of the week.

Water quality samples for the USEP will be collected by **Brown and Caldwell (Contact: Nancy Gardiner, 9665 Chesapeake Drive, Suite 201, San Diego, CA 92123 Phone 858-571-6742)**. For fixed schedule samples during the dry and wet seasons, one team of two will collect water samples from the thirteen sites over the course of two days. Preferably, the same sites will be visited on the same day of the week. For the flexible samples intended for wet weather monitoring, two teams of two will collect wet-weather grab samples from the thirteen sites during the storm event and at 48, 72, and 96 hours following the event.

Water quality samples for the AgSEP will *tentatively* be collected by CDM (**Contact: Thomas Lo, 9220 Cleveland Avenue, Suite 100, Rancho Cucamonga, CA 91730, Phone 909-579-3500).**

Wet weather water quality samples for the BMP Effectiveness Monitoring will be collected by **Brown and Caldwell (Contact: Nancy Gardiner, 9665 Chesapeake Drive, Suite 201, San Diego, CA 92123, Phone 858-571-6742).**

Dry weather water quality samples for the BMP Effectiveness Monitoring will be collected by **CDM (Contact: Thomas Lo, 9220 Cleveland Avenue, Rancho Cucamonga, CA 91730, Phone 909-579-3500).**

The selected laboratories for water quality analyses have the appropriate qualifications for bacteria indicators and other constituents to be measured. For this project water samples will be analyzed for TSS, fecal coliform and *E. coli* by **Orange County Health Care Agency Water Quality Laboratory, (Contact: Martin Getrich, 700 Shellmaker Road, Newport Beach, CA, 92660; 949-219-0423)**. Specialized analyses required for *Bacteroides* analysis will be conducted jointly by **OWCD (Contact: Menu Leddy, 10,500 Ellis Avenue, Fountain Valley, CA 92708 Phone 714-378-3200)** and **University of California-Davis (Contact: Alexander Schriewer, UC Davis Department of Civil & Environmental Engineering, One Shields Avenue, Davis, CA 95616)** laboratories. Samples will be submitted to laboratories for processing within the maximum holding times.

All personnel that will be involved in the implementation of this Monitoring Plan, including the primary contacts for each entity, are presented in Table 8.

6.8 Water Quality Analysis

Standard operating procedures for the analysis of water quality samples are provided in the Quality Assurance Protection Plan (QAPP).

Table 8
Key Personnel for Pathogen TMDL Monitoring Project

Title	Name (Affiliation)	Tel. No.
Regional Board Contract Manager	William Rice (Regional Board)	951-782-4130
Regional Board QA Officer	Pavlova Vitale (Regional Board)	951-782-4130
Grantee Project Director	Mark Norton (SAWPA)	951-354-4220
Grantee Project Manager	Rick Whetsel (SAWPA)	951-354-4220
Grantee Database Manager	Dean Unger (SAWPA)	952-354-4224
Agricultural/Dairy Representative	Pat Boldt	951-808-8531
Contractor Strategic Planner	Tim Moore (Risk Sciences)	615-370-1655
Contractor Project Manager	Richard Meyerhoff (CDM)	303-298-1311
Contractor QA Officer	Barbara Wells (CDM)	760-438-7755
Contractor Project Scientist	Steven Wolosoff (CDM)	909-579-3500
Contractor Project Scientist	Thomas Lo (CDM)	909-579-3500
Monitoring Contractor 1 Project Manager	Matt Yeager (SBCFCD)	909-387-8109
Monitoring Contractor 1 QA Officer	Janet Dietzman (SBCFCD)	909-387-8109
Monitoring Contractor 2 Project Manager	Chris Knoche (B&C)	714-689-4836
Monitoring Contractor 2 QA Officer	Nancy Gardiner (B&C)	858-571-6742
Water Quality Laboratory 1 Project Director	Douglas Moore (OC Health Care WQ Lab)	949-219-0423
Water Quality Laboratory 1 QA Officer	Joseph Guzman (OC Health Care WQ Lab)	949-219-0423
Water Quality Laboratory 2 Project Director	Donald Phipps (OCWD)	714-378-3200
Water Quality Laboratory 2 QA Officer	Menu Leddy (OCWD)	714-378-3200
Water Quality Laboratory 3 Project Director	Dr. Stefan Wuertz (UC Davis)	530-754-6407
Water Quality Laboratory 3 QA Officer	Alexander Schriewer (UC Davis)	530-752-1755

Section 7
Data Management and Reporting

7.1 Documents and Records

All laboratory and field data submitted to SAWPA will follow the guidelines and formats established by California Surface Water Ambient Monitoring Program (SWAMP) (http://www.waterboards.ca.gov/swamp/qapp.html). The CDM Project Manager will maintain a record of all field analyses and samples collected. All samples delivered to contract laboratories for analysis will include completed Field Chain of Custody forms (Attachment F). All contracted laboratories will generate records for sample receipt and storage, analyses, and reporting.

Copies of Chain of Custodies (Attachment F) and original Field Data Sheets (Attachment E) and flow measurement forms (Attachment G) for sites where a velocity cross section profile method was used to measure flow will be sent to the CDM QA Officer at the beginning of each month (9220 Cleveland Ave., Suite 100, Rancho Cucamonga, CA 91730, Phone: 909-579-3500, Fax: 909-980-5185).

All chemical monitoring records generated by these monitoring programs will be stored at CDM and SAWPA. Each of the contract laboratory records pertinent to the program will be maintained at the each of the contract laboratory main offices. Copies of all records held by the contract laboratories will be provided to CDM and SAWPA and stored in the SAWPA archives.

Copies of this Monitoring Plan and corresponding Quality Assurance Protection Plan (QAPP) will be distributed to all parties involved with the project. Copies will be sent to each Contract Laboratory QA Officer for distribution to appropriate laboratory staff. Any future amended Monitoring Plans and/or QAPPs will be held and distributed in the same fashion.

Reports generated as part of the QA/QC protocols for assessment of compliance with procedures outlined in the QAPP will be provided to SAWPA and stored in the SAWPA archives. This includes internal quarterly QA/QC updates and final QA/QC reports from each laboratory, and the QA/QC report(s) generated by the CDM QA Officer based on annual reviews of field sampling teams, and the SAWPA Database Manager's technical audit of database management procedures. Oversight and assessment procedures are described in more detail in Section 20 of the QAPP.

7.2 Database Management

A MSAR Pathogen TMDL project database (as part of the Santa Ana Watershed Data Management System [SAWDMS]) will be maintained by the SAWPA under the direction of the SAWPA Database Manager. SAWDMS is a watershed-wide database management system, which is linked to SAWPA's geographic information system (GIS). The system establishes a foundation for the standardization of data collected from various watershed stakeholders, creates a platform for Internet access to watershed data by appropriate entities, and provides a tool to manage water quality activities in the watershed.

All laboratory and field measurement data submitted to SAWPA for inclusion in the project database will follow the guidelines and formats established by SWAMP (http://www.waterboards.ca.gov/swamp/qapp.html). The laboratories will be required to provide data in both hard copy and electronic formats to CDM and SAWPA. The electronic form of submittals will be provided to the laboratories to ensure that the files can be imported into the project database with minimal editing. Data transmitted to SAWPA in a standard electronic format and uploaded to the database through batch set electronic means. The SAWPA Database Manager will periodically check the inventory of sampling activities against the results in the SAWDMS.

Prior to upload, a QA/QC review will be conducted by the SAWPA Database Manager to check new data against existing data in the database for completeness, validity of analytical methods, validity of sample locations, and validity of sample dates. The QA/QC will involve using automated data checking tools, which assess that new data to be uploaded follow specified rules, including issues such as alpha-numeric formatting, units of measurement, missing information, and others. The sample location information will be checked to ensure that sites are correctly referenced and that identifiers and descriptions match corresponding records from the existing database. Data not passing this QA/QC review will be returned to the originating laboratory or generator for clarification and or correction. When all data within a batch set have passed QA/QC requirements, the data will be uploaded to the database. A unique batch number, date loaded, originating laboratory, and the person who loaded the data will be recorded in the database, so that data can be identified and removed in the future if necessary.

The project database is backed up using built-in software backup procedures. In addition, all data files will be backed up on tape on a weekly basis as part of SAWPA's SOP for disaster recovery. Back up tapes are kept for a minimum of four weeks before they are written over. Tapes are rotated off-site for separate storage on a monthly (or more frequent) basis, in accordance with SAWPA Information Systems SOPs. Each back up session validates whether the files on tape are accurate copies of the original. SAWPA also maintains an access log showing who accessed the database, when, and what was done during the session. All changes to the database are stored in a transaction database with the possibility of rollback, if necessary.

Data will be stored on a Windows 2003 Server with a 2 GHz + CPU and 2Gb RAM with a fail safe RAID 5 configuration. The server checks for operating system updates daily and downloads and installs patches and service packs as necessary. The current server is two years old, and as per SAWPA policy, will be replaced after a maximum of 4 years of service. The server is also protected with Norton Anti-Virus software which is updated daily. The database software is Microsoft SQL Server 2000 standard edition with Service Pack 4. The database administrator checks the Microsoft Website for new patches and service packs on a monthly basis and installs updates as necessary. The general policy for updating operating system and database software is to evaluate the software on a test machine after a new version has been out for approximately 1 year. The new version is then installed at the discretion of the network or database administrator.

The database will be operated with a transaction log recording all changes with ability to roll back if necessary. Full database backups will occur on a weekly basis and immediately before batch uploads. It is expected TMDL data will be loaded quarterly to twice per year. At the time when data is uploaded, the SAWPA Database Manager will check that the inventory of monitoring activities adequately matches with the number and type of records in the database.

Data will be exported from SAWDMS into the SWAMP format using a pre-made query that will map data fields from SAWDMS to the SWAMP template. The exported data will then be sent to the SWRCB IM Coordinator for processing into the SWAMP database. The data will be retrieved for analysis and report writing by exporting from SAWDMS using pre-made queries.

7.3 Data Analysis

Basic descriptive statistics will be developed based on results on water quality analyses and presented to the Workgroup by CDM during progress updates, when appropriate. Also, the data analysis report will present descriptive statistics based on all data collected during the Grant Project period. CDM will use Microsoft Excel to conduct all data analyses. Rolling geometric means will be computed for bacteria indicator concentrations and plotted in the data analysis report. Geometric means will be used to assess frequency of compliance with numeric targets in the TMDL.

In addition, a qualitative analysis of trends will be conducted. This analysis will use a variety of plotting techniques to assess the relationship between bacteria indicator concentrations or relative abundance of different source organisms to factors including but not limited to season, weather conditions, POTW effluent influences, land use within drainage area, and both structural and non-structural stormwater controls.

7.4 Project Reporting

CDM will be sharing data and preliminary analyses with the MSAR Pathogen TMDL Workgroup, including the RWQCB, in the form of oral presentations with supporting slides at regularly scheduled Taskforce meetings, when appropriate and in quarterly progress reports.

All contract laboratories will prepare a QA/QC report, which summarizes the Projects overall adherence to established analytical SOPs.

Table 9 summarizes reporting that will be conducted under this Monitoring Plan. Key data reports include:

- In July 2008, CDM will prepare a draft Year 1 Data Analysis Report that includes analysis of data from the first year of monitoring at the Watershed-Wide monitoring sites and the data collected from the USEP monitoring effort. This report will include a summary of each laboratory specific QA/QC reports. The Workgroup will review this report and provide comments to CDM. CDM will then provide a final data analysis report.

- CDM will prepare a draft BMP Effectiveness Study report in July 2008. After the Workgroup provides comments to CDM, a final report will be prepared.

- An AgSEP Monitoring Program Data Analysis Report will be prepared within two months after the completion of sampling under this program. The draft report will be reviewed by the Workgroup; a final report will be prepared based on Workgroup comments.

After the Grant Period is complete, future water quality data analysis reporting will be prepared in December (covering the results for the dry season) and May (covering the results for the wet season) of each year.

Table 9. Summary of Project Reporting			
Report	**Reporter**	**Type**	**Report Date**
Interim Progress Update	CDM	Oral Presentations	Workgroup Meetings
Interim Progress Report	CDM	Report	Quarterly
QA/QC Updates	OC Health Care WQ Lab	E-mail status update	Quarterly
QA/QC Final Report	OC Health Care WQ Lab	Report	June 30, 2008
QA/QC Updates	OCWD Water Quality Laboratory	E-mail status update	Quarterly
QA/QC Final Report	OCWD Water Quality Laboratory	Report	June 30, 2008
QA/QC Updates	UC Davis Water Quality Laboratory	E-mail status update	Quarterly
QA/QC Final Report	UC Davis Water Quality Laboratory	Report	June 30, 2008
Field Sampling Review	CDM QA Officer	Report	June 30, 2008
Internal Technical Audit of Database Management	SAWPA Database Manager	Report	June 30, 2008
Draft Data Year 1 Analysis Report (USEP & Watershed-Wide Monitoring)	CDM	Draft Document	July 31, 2008
Review of Draft Year 1 Data Analysis Report	MSAR Pathogen TMDL Workgroup	Comments	August 15, 2008
Final Year 1 Data Analysis Report	CDM	Final Document	August 31, 2008
Draft AgSEP Monitoring Program Data Analysis Report	CDM (*tentative*)	Draft Document	Dependent on when sampling occurs
Review of Draft AgSEP Monitoring Program Data Analysis Report	MSAR Pathogen TMDL Workgroup	Comments	1 month after submittal of draft AgSEP report for review
Final AgSEP Monitoring Program Data Analysis Report	CDM (*tentative*)	Final Document	1 month after comments received on draft AgSEP report
Draft BMP Effectiveness Study Report	CDM	Draft Document	July 31, 2008
Review of Draft BMP Effectiveness Study Report	MSAR Pathogen TMDL Workgroup	Comments	August 15, 2008
Final BMP Effectiveness Study Report	CDM	Final Document	August 31, 2008
Reporting Beyond Grant Period			
Wet Weather Season Data Analysis Report	TBD	Report	May 31st (of each yr)
Dry Weather Season Data Analysis Report	TBD	Report	December 31st (of each yr)

Section 8
References

APHA, 1998. Standard Methods for the Examination of Water and Wastewater. 20th Edition. American Public Health Association, Washington DC.

Puckett, M. 2002. Quality Assurance Management Plan for the State of California's Surface Water Ambient Monitoring Program ("SWAMP"). California Department of Fish and Game, Monterey, CA. Prepared for the State Water Resources Control Board, Sacramento, CA. 145 pages plus Appendices.

Santa Ana Regional Water Quality Control Board, 2005. Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate Bacterial Indicator Total Maximum Daily Loads (TMDLs) for Middle Santa Ana River Watershed Waterbodies, Resolution No. R8-2005-0001, Adopted May 15, 2005.

Santa Ana Regional Water Quality Control Board, 1995. Water Quality Control Plan. Resolution No. 94-60.

US EPA, 1986. Ambient Water Quality Criteria for Bacteria. Office of Water Regulations and Standards, Criteria and Standards Division, EPA 440/5-84-002, January.

US EPA, 1997. Volunteer Stream Monitoring: A Methods Manual. Office of Water, EPA 841-B-97-003, 1997.